(12) LEVEL III

AD-E300869

AD A088512

DNA 5159F-2

DELFIC: DEPARTMENT OF DEFENSE FALLOUT PREDICTION SYSTEM

Volume II – User's Manual

Atmospheric Science Associates
P.O. Box 307
Bedford, Massachusetts 01730

31 December 1979

Final Report for Period 16 January 1979—31 December 1979

CONTRACT No. DNA 001-76-C-0010

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Prepared for
Director
DEFENSE NUCLEAR AGENCY
Washington, D. C. 20305

80 8 1 026

(18) DNA, SBIE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

(19)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER
DNA 5159F-2, AD-E300 869

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
(6) DELFIC: DEPARTMENT OF DEFENSE FALLOUT PREDICTION SYSTEM. Volume II. User's Manual.

5. TYPE OF REPORT & PERIOD COVERED
(9) Final Report for Period
16 Jan [illegible] – 31 Dec 79

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
(10) Hillyer G. Norment

8. CONTRACT OR GRANT NUMBER(s)
(15) DNA 001-76-C-0010

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Atmospheric Science Associates
P.O. Box 307
Bedford, Massachusetts 01730

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
(16) Subtask V99QAXNA011-02

11. CONTROLLING OFFICE NAME AND ADDRESS
Director
Defense Nuclear Agency
Washington, D.C. 20305

12. REPORT DATE
(11) 31 Dec[illegible]79

13. NUMBER OF PAGES
234

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)
(17) A011
(12) 234

15. SECURITY CLASS (of this report)
UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES
This work sponsored by the Defense Nuclear Agency under RDT&E RMSS Code B325076464 V99QAXNA01102 H2590D.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Nuclear Fallout
Nuclear Weapons Effects
Fallout Modeling
Fallout Prediction
DELFIC

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
DELFIC predicts local fallout from nuclear weapon explosions in the yield range from 0.001 to 100,000 KT over a range of heights of burst from shallow subsurface to fallout-safe airbursts. The code is designed for research use and to serve as a comparison standard for production-oriented codes.

Code organization, data preparation and data input are described. Complete FORTRAN code listings are included.

DD FORM 1473, 1 JAN 73 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

392152

PREFACE

The author gratefully acknowledges the support and cooperation of Dr. David L. Auton of the Defense Nuclear Agency.

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1. INTRODUCTION AND OVERVIEW

DELFIC (DEfense Land Fallout Interpretative Code) is intended for research in local nuclear fallout prediction and to serve as a standard against which predictions by less capable, production-oriented codes can be judged. By local fallout we mean the intensely radioactive material which falls to the ground within several to several hundred miles of ground zero, depending on the size of the explosion. The code is essentially open-ended with regard to input data, it is highly flexible in that it offers many options that would not be available in a production-oriented code, and it strives to include as much of the physics of fallout transport and activity calculation, without resorting to short cuts, as is practicable.

Calculation begins at about the time the fireball reaches pressure equilibrium with the atmosphere. Rise, growth and stabilization of the nuclear cloud is computed by a dynamic model that treats the cloud as an entraining bubble of hot air loaded with water and contaminated ground material. The fallout particle cloud, including the stem, is formed during the cloud rise. This calculation requires specification of a vertical profile of atmospheric data: pressure, temperature, humidity and wind; thus the height, dimensions and vertically sheared horizontal displacement of a particular cloud are determined by the atmospheric stability and winds.

After cloud stabilization, representative parcels of fallout are transported through an atmosphere that is defined by input data. The user may specify a single vertical wind profile and assume a steady state. He may specify any number of wind profile updates. He may resolve the transport space in the horizontal and specify multiple wind profiles defined at different geographical locations, in which case winds in the cells of a three-dimensional space grid are determined by an interpolation procedure.

During transport, fallout parcels are expanded in the horizontal by ambient turbulence. Turbulence data may be input along with the winds, but since these data are rarely available, they can be calculated by the code.

To account for effects of vertical wind shear on the dispersion of individual parcels, tops and bases of the parcels are transported to ground impaction separately, and then recombined. The impacted parcels are distributed over the ground via a bivariate Gaussian function.

Any or all of sixteen unique quantities computed from the deposited fallout may be mapped. Radioactivity is calculated rigorously for any time by summing exposure or exposure rate contributions from all nuclides in the mixture of fission products. Any of twelve different types of fission may be specified. Induced activity in soil material in the fallout and in ^{238}U may be accounted for.

Physical and mathematical bases for DELFIC are given in Volume I of this set.

2. CODE DESCRIPTION

2.1 STRUCTURE

DELFIC is a FORTRAN code in three major parts or modules:

1. Initialization and Cloud Rise Module (ICRM)

2. Diffusive Transport Module (DTM)

3. Output Processor Module (OPM), plus the Particle Activity Submodules which are controlled by the OPM.

The ICRM accepts basic data and carries the prediction calculation through rise and stabilization of the nuclear cloud. The DTM transports fallout parcels from the stabilized cloud to ground impaction, and the OPM processes the deposited parcels into fallout maps.

Communication between modules is via external storage units (Table 1) so that the modules can and should be overlayed. COMMON NUMTAP(15), which appears in each overlay executive program, contains external storage unit numbers. Figure 1 displays the code organization including the overlay structure.

Table 2 provides an alphabetical listing of all DELFIC programs with a description of the function of each. FORTRAN codes are listed in sec. 5. The executive code (ICRMEX, DTMEX, OPMEX) of each module contains extensive glossaries of mnemonics.

2.2 COMPUTER REQUIREMENTS

This version of DELFIC operates on the CDC 6600 computer with the overlay structure given in Fig. 1. The amount of central memory storage required depends on the demands of the problem. Variable dimensioned arrays are used (sec. 2.3). For the example problem (sec. 4), which uses array dimensions

TABLE 1

EXTERNAL STORAGE UNITS USED BY DELFIC

NUMTAP(I) Index, I	Symbolic Name	Module	Use
1	ISIN	ICRM DTM OPM	System unit for card input.
2	ISOUT KOUT	ICRM DTM OPM	System unit for printing.
3	IRISE	ICRM	Temporary storage during atmospheric stability data processing (Subroutine ATMR), and storage of basic data and fallout parcel descriptions in the stabilized cloud before correction of horizontal positions for advective transport during cloud rise. (Subroutines RSXP and WNDSFT).
	IPOUT	DTM	Output of basic data and fallout deposit increment (i.e., grounded parcel) descriptions from the DTM. (Subroutines DTMINT, DUMPER and SPRVS).
	IPOUT KPOUT KTAPE	OPM	Input of basic data and fallout deposit increment descriptions to the OPM. (Subroutines OPM1, OPM2, GOGO).
4	JPARN	ICRM	Output of basic data and fallout parcel descriptions in the stabilized cloud after correction of horizontal positions for advective transport during cloud rise. (Subroutine WNDSFT).
	JPARN	DTM	Input of basic data and fallout parcel descriptions to the DTM. (Subroutines DTMINT and SPRVS).
5	JPOUT KTAPE LTAPE	OPM	Temporary storage of fallout deposit increment descriptions for maps that require storage in excess of the OMAP array capacity. (Subroutines OPM2, GOGO and PDMP).

TABLE 1 (con't.)

NUMTAP(I) Index, I	Symbolic Name	Module	Use
6	KPOUT KTAPE LTAPE	OPM	Temporary storage of fallout deposit increment descriptions for maps that require storage in excess of the OMAP array capacity. (Subroutines OPM2, GOGO and PDMP).
7	IPNCH	OPM	System unit for card punch. (Subroutine SRTCNT).
8	MBTAPE	OPM	Multiburst output tape. Not currently used. (Subroutine MAP).
9	INPAM INTP	OPM	Fission yield data used for activity calculation (PAM1).

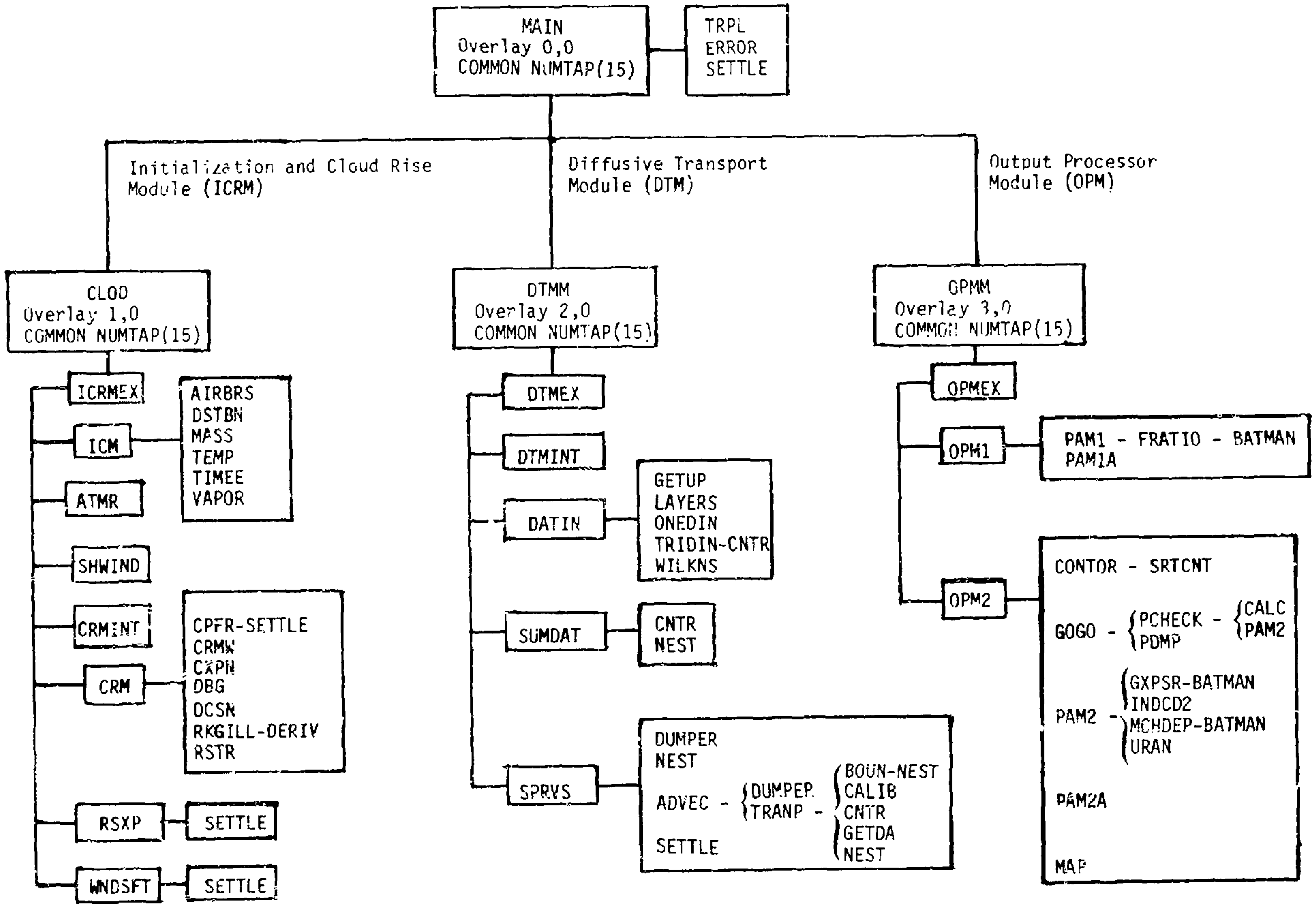

Figure 1. Organization of the DELFIC code. See Table 2 for program descriptions.

TABLE 2

ALPHABETICAL LIST AND DESCRIPTION OF PROGRAMS

Program	Module	Called By	Description
ADVEC	DTM	SPRVS	For each fallout parcel: calls TRANP to transport top and base separately from stabilized cloud to ground impact, and recombines impacted top and base to form a single deposit increment of fallout.
AIRBRS	ICRM	ICM	For a pure airburst: sets particle size distribution parameters, and sets time, temperature and mass of debris contained in the initial cloud.
ATMR	ICRM	ICM	Inputs and processes atmospheric stability and humidity data (altitude, temperature, pressure, relative humidity, and optionally, density and viscosity).
BATMAN	OPM	FRATIO GXPSR MCHDEP	Computes activity decay chains by means of the Bateman equation (I, eq. (4.2.1)).
BOUN	DTM	TRANP	Calculates horizontal coordinates of the point of entrance into a wind data cell of a fallout parcel transported from a contiguous cell.
CALC	OPM	PCHECK	Computes map contributions from individual deposit increments of fallout and adds these to the map ordinate array OMAP.
CALIB	DTM	TRANP	Returns a justified index which relates a point to its corresponding position in a data array.
CNTR	DTM	SUMDAT TRANP TRIDIN	Returns horizontal coordinates of the center of a wind field space cell.
CONTOR	OPM	OPM2	Determines unordered sets of map points that lie on specified contours.
CPFR	ICRM	CRM	Computes fallout rate from the cloud during its rise.
CRM	ICRM	ICRMX	Executive code for cloud rise calculation.
CRMINT	ICRM	ICRMX	Initialization for the cloud rise calculation.
CRMW	ICRM	CRM	Prints cloud rise history table.
CXPN	ICRM	CRM	Tabulates cloud rise history table and tests for cloud stabilization.

TABLE 2 (con't.)

Program	Module	Called By	Description
DATIN	DTM	DTMEX	Directs input and processing of wind and turbulence data.
DBG	ICRM	CRM	Prints debug output for the cloud rise calculation.
DCSN	ICRM	CRM	Sets "wet" and "dry" mode switches and tests for abnormal cloud rise.
DERIV	ICRM	RKGILL	Computes differential equation values at each time step during cloud rise.
DSTBN	ICRM	ICM	Computes particle size distribution histogram tables.
DTMEX	DTM		DTM executive code.
DTMINT	DTM	DTMEX	Initializes for the DTM.
DUMPER	DTM	ADVEC SPRVS	Writes deposit increment data onto external unit IFOUT, and prints these data if requested.
FRATIO	OPM	PAM1	Computes parameters for the radial distribution fractionation model, which uses them to distribute activity with particle size.
GETDA	DTM	TRANP	Computes an average wind or turbulence component from the summed data arrays (I, eq. (3.2.3)).
GETUP	DTM	DATIN	Prepares the horizontal space resolution arrays NET and NETSU for a horizontally resolved wind field.
GOGO	OMP	OPM2	Controls flow of deposit increment data to and from external storage, and calls PCHECK to process the data for map preparation.
GXPSR	OPM	PAM2	Computes the distribution of total fission produce activity with particle size, FP.
ICM	ICRM	ICRMEX	Controls input and printing of basic data, and controls calculation of initial conditions in the nuclear cloud.
ICRMEX	ICRM		ICRM executive code.
INDCD2	OPM	PAM2	Computes activity induced in soil lifted by the cloud and adds this to the activity distribution.

TABLE 2 (con't.)

Program	Module	Called By	Description
LAYERS	DTM	DATIN	Constructs arrays ZBH and ZCH of atmosphere strata base and center altitudes for a three-dimensionally resolved wind field.
MAP	OPM	OPM2	Constructs and prints fallout maps from the map ordinate array OMAP.
MASS	ICRM	ICM	Returns mass of fallout material in the cloud (fireball) at the initial time for a surface or near surface burst.
MCHDEP	OPM	PAM2	Computes the distribution of a single radioactive mass chain with particle size.
NEST	DTM	SPRVS SUMDAT TRANP BOUN	Given a set of horizontal space coordinates, returns the index of the space net mesh and its horizontal boundary coordinates.
ONEDIN	DTM	DATIN	Inputs and processes wind or turbulence data for a horizontally homogeneous wind field.
OPMEX	OPM		OPM executive code.
OPM1	OPM	OPMEX	Initializes for the OPM.
OPM2	OPM	OPMEX	Initializes and controls computation for fallout map preparation.
PAM1	OPM	OPM1	Executive code for time-independent part of the rigorous activity calculations.
PAM1A	OPM	OPM1	Matches fission type parameter FISSID with an activity K factor. Used for pure airbursts and specified size-activity particle distributions.
PAM2	OPM	OPM2 PCHECK	Executive code for the time-dependent part of the rigorous activity code. Computes and prints the activity distribution table FP.
PAM2A	OPM	OPM2	Computes and prints the activity distribution table FP for airbursts and specified size-activity distributions.
PCHECK	OPM	GOGO	Computes boundaries of the contribution ellipses for fallout deposit increments. (I, sec. 5.2)

TABLE 2 (con't.)

Program	Module	Called by	Description
PDMP	OPM	GOGO	Writes deposit increment data onto an external storage unit for those deposit increments that will contribute to subsequent map sections.
RKGILL	ICRM	CRM	Integrates cloud rise differential equations by a fourth-order Runge-Kutta-Gill algorithm.
RSTR	ICRM	CRM	Preserves or restores cloud properties during integration of the cloud rise differential equations. Operates with RKGILL.
RSXP	ICRM	ICRMEX	Passes through the cloud rise history table constructed during the dynamic cloud rise simulation such as to develop the particle cloud structure.
SETTLE	ICRM DTM	CPFR RSXP SPRVS	Returns still air, gravity settling speed of a sphere when given sphere diameter and density, and atmospheric conditions.
SHWIND	ICRM	ICRMEX	Inputs and processes shot-time wind data for use in computing shear effects on cloud rise and in advecting the particle cloud during the period of cloud rise.
SPRVS	DTM	DTMEX	Controls transport of fallout parcels from the stabilized cloud to ground impact.
SRTCNT	OPM	CONTOR	Orders (approximately) the map contour points determined by CONTOR.
SUMDAT	DTM	DTMEX	Computes weighted sums of wind and turbulence data (I, eq. (3.2.2)).
TEMP	ICRM	ICM	Returns temperature of condensed and vapor phase material in the cloud (fireball) at the initial time.
TIMEF	ICRM	ICM	Returns the time at which the initial cloud (fireball) is defined.
TRANP	DTM	ADVEC	Returns impact point coordinates and dispersion variances of a fallout parcel base or top given its coordinates in the stabilized cloud.
TRIDIN	DTM	DATIN	Computes a three-dimensionally resolved wind or turbulence field from input data.

TABLE 2 (con't.)

Program	Module	Called By	Description
URAN	OPM	PAM2	Computes activities of ^{239}U and ^{239}Np produced by capture of neutrons by the ^{238}U in the device.
VAPOR	ICRM	ICM	Returns the portion of the fallout mass in the initial cloud (fireball) that is in the vapor state. (This datum not currently used.)
WILKNS	DTM	DATIN	Computes turbulence data via Wilkins' method. (I, sec. 3.3)
WNDSFT	ICRM	ICRMEX	Adjusts horizontal coordinates of individual fallout parcels to account for advective transport during cloud rise and stabilization.

as given in the sec. 5 code listings, about 41000_{10} (120000_8) central memory words, including those used by the operating system, are required. Nine external storage units, including three system I-O units, are required (Table 1).

Computing time is strongly dependent on the scope of the problem in terms of number and type of wind fields, number of fallout parcels transported and number and sizes of maps. To give a general idea of computing time, complete simulations of test shots Johnie Boy (0.5 KT), Jangle-S (1.2 KT), Koon (150 KT) and Zuni (3380 KT) were done in a single run in 609 seconds CPU time on a CDC 6600 computer. Single H + 1 hour normalized exposure rate maps were produced for each. Wind fields were defined by single, updated profiles, and 100 particle size classes and 20 cloud subdivisions were defined for each. Layer-by-layer transport was used. Wind updates and numbers of map points were:

Shot	Number of Wind Updates	Number of Map Points
Johnie Boy	2	846
Jangle-S	3	3538
Koon	3	1513
Zuni	6	1829

2.3 VARIABLE DIMENSIONED ARRAYS

Variable dimensioned arrays are used in two modules: DTM and OPM. In the OPM there is only one such array, OMAP, the map ordinate array. The user may change the size of this array by changing two numbers in Subroutine OPMEX. These are the dimensions of the OMAP array and the value of the parameter NMAP (lines 133 and 135 of Subroutine OPMEX); NMAP should equal the OMAP array dimension.*

*DELFIC is programmed to accommodate maps with numbers of points greater than NMAP (sec. 2.5).

For the DTM the situation is more complex in that there are fifteen arrays, many of which are multiply dimensioned. These arrays all are involved in space and time resolution of the wind field.

In spatially resolving the wind field we separate horizontal from vertical resolution since at each vertical stratum we find an identical horizontal net. Thus, the parameter NDATF is at least as large as the total number of mesh units in the horizontal net, and KBHF is at least as large as the number of vertical strata. The parameter LTIMF is at least as large as the total number of updates, including the initial wind field. See lines 128 and 129 of the DTMEX FORTRAN listing. For the other parameters on these lines of the listing: ICF and JCF are at least as large as the numbers of subdivisions (i.e., mesh units) along the x and y axis respectively of the "control" horizontal space resolution net (Appendix A); NCF is at least as large as 4*(maximum number of zeros punched in MARY input cards for any level of mesh subdivision); MARF ≥ MAX1(ICF*JCF,NCF).

For wind fields that are not spatially resolved in the horizontal, much central memory storage is saved by the following designations: NDATF = ICF = JCF = NCF = MARF = 1.

The arrays on lines 122 through 127 of the DTMEX code listing must be dimensioned to be consistent with the integer quantities discussed above. Specifically, we must have:

```
NET(ICF,JCF),NETSU(NCF),WAVG(KBHF,LTIMF)
USUM(KBHF,NDATF,LTIMF),VSUM(KBHF,NDATF,LTIMF)
DXSUM(KBHF,NDATF,LTIMF),DYSUM(KBHF,NDATF,LTIMF)
RSUM(KBHF,NDATF,LTIMF),CAVS(KBHF),HDAV(LTIMF)
ZBH(KBHF),ZCH(KBHF),TIMUP(LTIMF),MARY(MARF)
WFZ(KBHF,NDATF,LTIMF),TSUM(KBHF).
```

Thus, if for a particular case we have ICF = 3, JCF = 4, NCF = 8, KBHF = 13, LTIMF = 1, then NDATF = 18 and MARF = 12, and we should have

```
NET(3,4),NETSU(8),WAVG(13,1)
USUM(13,18,1),VSUM(13,18,1)
etc.
```

2.4 MAP SPECIFICATION

All maps are rectangular with west-to-east (x axis), south-to-north (y axis) orientation. Boundary coordinates and at least one of the two grid spacings (the x axis spacing) must be specified. If the y axis grid spacing is not specified, the code sets it on the assumption of 10 and 6 printed characters per inch in the horizontal (x axis) and vertical (y axis) directions on the printer paper such as to produce a spatially undistorted map.

Along with the boundaries and grid intervals, the user may specify a combined ground roughness-survey meter response correction factor which sometimes is warranted in comparing calculated with observed exposure or exposure rate fallout maps. Predicted exposure rates are based on laboratory measurements of fission product yields and on factors called exposure rate multipliers that convert the fission yields for individual nuclides to exposure rates at one meter height above an infinite plane on which the fission products are assumed to be uniformly distributed. One correction, the ground roughness factor, is required to account for absorption of radiation by small irregularities, or roughness elements, in an actual ground surface. The other correction is necessary to account for variation of response of survey meters to radiation over the spectrum of wave lengths encountered. Ground roughness factors for Nevada Test Site terrains are estimated to be in the range of 0.70 to 0.75, and an instrument response factor of about 0.75 is appropriate for commonly used survey meters. The product of these two factors is approximately 0.5, and this factor is commonly applied to calculated fallout patterns for test shots whose fallout activity was measured over land. On default of input, this parameter (GRUFF) is set to unity.

Any number of maps can be requested (Table 3) for a set of dimensional specifications as discussed above. These dimensional specifications can be changed and another set of maps can be requested, etc., in the same run.

Along with a map request, the user may specify certain other parameters (in addition to a mass chain specification for map option 14 and T1 and T2 which are required for various options). These are:

TABLE 3

MAP REQUEST OPTIONS

Map Option Code, NREQ	Description
0	Termination of request set.
1	Count of fallout deposit increments that contribute to each map ordinate.
2	Exposure rate normalized* to H + 1 hour (Roentgen hr^{-1}).
3	Exposure rate at time H + T1 hours, accounting for time of arrival of fallout. (Roentgen hr^{-1}).
4	H + 1 hour normalized* exposure rate resulting from particles in diameter range T1 to T2 micrometers.** (Roentgen hr^{-1}).
5	Integrated exposure from H + T1 hours to infinity, accounting for time of arrival of fallout by the approximate method.+ (Roentgen).
6	Integrated exposure from H + T1 to H + T2 hours, accounting for time of arrival of fallout by the approximate method.+ (Roentgen).
7	Integrated exposure from H + T1 to H + T2 hours assuming all fallout has arrived by H + T1 hours. (Roentgen).
8	Integrated exposure from H + T1 hours to infinity assuming all fallout has arrived by H + T1 hours. (Roentgen).
9	Integrated exposure from H + T1 hours to infinity, accounting for time of arrival of fallout by the exact method.++ (Roentgen).
10	Integrated exposure from H + T1 to H + T2 hours, accounting for time of arrival of fallout by the exact method.++ (Roentgen).
11	Mass of fallout per unit area (kg m^{-3}).

TABLE 3 (con't.)

Map Option Code, NREQ	Description
12	Mass of fallout per unit area deposited from H + T1 to H + T2 hours (kg m^{-3}).
13	Mass of fallout per unit area deposited by particles in diameter range T1 to T2 micrometers.** (kg m^{-3}).
14	Activity per unit area from an individual mass chain at T1 hours in units of curies m^{-2}, or in equivalent fissions m^{-2} if T1 = 0.
15	Time of onset of fallout. (s)
16	Time of cession of fallout. (s)
17	Diameter of smallest particle deposited. (μm)
18	Diameter of largest particle deposited. (μm)

* A "normalized" calculation is one in which it is assumed that all fallout is deposited by H + t regardless of actual deposition time.

** When specifying T1 and T2 particle diameters, make T1 slightly smaller and T2 slightly larger than the tabulated central diameters for the particle size classes.

\+ The $t^{-1.26}$ decay factor is used to compute exposure rate at times other than H + 1 hour (I, sec. 4.3), though activity at H + 1 hour may be calculated by the exact method. (See I, sec. 4.1)

++ Warning: This calculation probably will consume a lot of computer time. A complete activity calculation is done for each deposit increment of fallout. Consider using one of the approximate methods (requests 5 and 6).

1. A parameter that specifies which of two optional formats is to be used to print map ordinate values. These are:

   a. The two-line E format,

      NNNNNN
         ± V.VVV,

      which is to be interpreted as

      $\pm$ V.VVV x 10^{NNNNNN}

   b. The two-line F 11.3 format

      NNNNNN
         ± V.VVV,

      which is to be interpreted as

      ± NNNNNNV.VVV.

   The two-line E format is used on specification default.

2. Parameters QCUT and CUTMAP which define lower thresholds for acceptance of contributions from single deposit increments and cumulative contributions respectively. Thus any contribution at any map point with value less than QCUT is ignored, and any total contribution at any point less than CUTMAP is set to zero. If not specified by the user, these parameters are set by the code to values consistent with the type of map requested and the time after detonation. (QCUT is the same as ω_{min} of I, sec. 5.2; also see Appendix B)

(Subroutine OPM2)

2.5 MAP SIZE

Fallout map ordinate values are stored in an array OMAP with single, variable dimension NMAP (sec. 2.3). While only NMAP points can be stored in central memory, there is almost no limitation on map size.* Maps that require

*The only limitation on map size is that there be space in central memory for at least two y axis columns of points.

points in excess of NMAP are computed and printed in sections. The code determines the number of sections required (Subroutine OPM2) and during computation of each, writes deposit increment data that may contribute to subsequent sections on external storage units (Subroutine PDMP).

2.6 CONTOUR POINT DATA

For any map that can be wholly contained in the OMAP array (i.e., with less than NMAP points; see sec. 2.5), x,y coordinates of points on as many as eight contours can be punched and printed. Subroutine CONTOR determines the coordinates by straightforward linear interpolation, and Subroutine SRTCNT attempts to order them in sequence around closed contours. Multiple closures are accommodated. The ordering procedure is simple: each point is followed by the point closest to it which has not yet been sequenced. When the next point turns out to be the first point in the sequence, the contour is closed. Thus, the first and last points in the list for a closed contour are identical.

This simple ordering procedure may produce false closures and cross-overs. Thus, the user must plot the contours by hand and compare the contour points with the plots carefully before attempting to use them.

3. DATA INPUT

3.1 INITIALIZATION AND CLOUD RISE MODULE CARD DESCRIPTIONS

Card No.	Variables and Format	Data Description
1	DETID(12),(12A6)	ICRM run identification
2	IC(20),(20I4)	Control Integers: (see below)

I	IC(I)	Action
1	0	lognormal particle size distribution
	1	power-law particle size distribution
	2	tabular particle size distribution (I, sec. 2.1.6)
2	0	siliceous soil (continental soil, including Nevada Test Site)
	1	calcareous soil (coral soil, including Pacific islands) (see card 3 below)
3	IF(IC(3).GT.0)	causes return after print of initial conditions. Otherwise calculation proceeds to cloud rise simulation.
4	KATM	atmosphere stability data (altitude, temp., press., relative humidity, density viscosity) print skip integer. If KATM=0, do not print data. KATM=N, print data at every Nth altitude increment of 200m beginning at -1000 + 200(KATM-1)m to 50 km.
5	IF(IC(5).NE.0)	take particle distribution to be a diameter-activity fraction distribution. Otherwise take it to be a diameter-particle number (or mass fraction) distribution. Normally, IC(5) is left blank.
6	IF(IC(6).NE.0)	causes printout of cloud rise debug data. (Subroutine DBG)

Card No.	Variables and Format	Data Description
3	W,FW,HEIGHT,ZBRSTZ, SLDTMP,PHI,(8F10.0)	W = total yield (KT), FW = fission yield (KT), HEIGHT = height of burst above ground zero (m), ZBRSTZ = altitude relative to sea level of ground zero (m) SLDTMP = temperature (^{o}K) of soil solidification. (I,sec.2.1.2) default values: siliceous soil = 2200^{o}K, calcareous soil = 2800^{o}K (see card 2) The distribution of activity with particle size is sensitive to this temperature. (I,sec. 4.2.2) PHI = fraction of available energy in the cloud at the initial time used to heat air and soil. The remainder is used to vaporize and heat water. Default value = 1.0.
4	NDSTR,KDI,IRAD, (20I4)	NDSTR = number of size classes in the particle distribution histogram. Default value = 100, but default not allowed for tabular particle size distribution (IC(1) = 2 on card 2) (I, sec. 2.1.6 and Appendices A and B). KDI = number of vertical cloud subdivisions in the initial cloud for each particle size class. Default value = 15 + ℓn(W). IRAD = cloud horizontal subdivision parameter. Normally this is left blank (I,sec. 2.3)

ICRM Card Descriptions

Card No.	Variables and Format	Data Description
5	XGZ.YGZ,TGZ,(8F10.0)	XGZ = x coordinate (west to east, m) of ground zero YGZ = y coordinate (south to north, m) of ground zero TGZ = detonation time (s) Normally, this card is blank.
6ℓ	DNS,DMEAN,SD, (8F10.0)	For lognormal particle size distribution (IC(1) = 0 in card 2) DNS = fallout particle density (g cm^{-3}). Default value = 2.6 DMEAN = median diameter of the particle number vs. diameter distribution (μm). Default value = 0.407 μm and SD = 4.0 SD = geometric standard deviarion of the particle number vs. diameter distribution (dimensionless) (I,sec. 2.1.6 and I, Appendix A)
6p	DNS,CAYM,EXPO, (8F10.0)	For power-law particle size distribution (IC(1) = 1 on card 2) DNS = same as for 6ℓ. CAYM = k/mass ratio (m^{EXPO-1} kg^{-1}) EXPO = exponential parameter X (dimensionless) (I, sec. 2.1.6 and I, Appendix B)
6t	DNS,(8F10.0)	For tabular particle size distribution. (IC(1) = 2 on card 2) DNS = same as for 6ℓ (I, sec. 2.1.6)
6t:1 . . . . 6t:NDSTR 6t:NDSTR+1	DIAM(1) FMASS(1) . . . . DIAM(NDSTR),FMASS(NDSTR) DIAM(NDSTR+1)	For tabular particle size distribution only. (IC(1) = 2 on card 2) DIAM(I) = upper (i.e., larger particle) boundary diameter of the Ith particle size class FMASS(I) = mass or activity fraction (depending on value of IC(5) on card 2) in the Ith particle size class DIAM(NDSTR+1) = lower (i.e., smaller particle) boundary diameter of the NDSTRth particle size class The tabulation begins with the largest particle and continues in order to the smallest. (I, sec. 2.1.6)
	Cards 1 - 6 are read by Subroutine ICM. Begin atmospheric stability data input via Subroutine ATMR.	
7	ATID(12), (12A6)	Atmospheric stability data identification.
8	FMT(12), (12A6)	Atmospheric stability data object-time format. (See cards 11)
9	SCALE(8), (8F10.0)	Atmospheric stability data scale factors. Default values for SCALE(1) through SCALE(6) = 1.0. (See cards 11)
10	N1,N2,N3,N4,N5,N6, (20I4)	Atmospheric stability data input field pointers. (See cards 11)

ICRM Card Descriptions

Card No.	Variables and Format	Data Description
11:1 . . . . . 11:NAT	AP(6), (FMT, see card 8) . . . . AP(6)	Altitude (m) = (AP(N1) + SCALE(7)) * SCALE(1) (relative to sea level) Temperature (°K) = (AP(N2) + SCALE(8)) * SCALE(2) Pressure (Pa) = AP(N3) * SCALE(3) Relative Humidity (%) = AP(N4) * SCALE(4) Density (kg m^{-3}) = AP(N5) * SCALE(5) Dynamic Viscosity (kg $m^{-1}s^{-1}$) = AP(N6) * SCALE(6) Either all quantities may be specified or as few as four may be specified, but altitude, temperature, relative humidity and either of pressure or density must be specified; the missing quantities are computed by the program. The field pointers N1, N2, etc., are from card 10 and the scale factors, SCALE(I), are from card 9. The program interpolates the data into arrays at 200m altitude intervals from -1000m to 50 km altitude (relative to sea level), and supplies standard data at -1000m and 50 km if not specified.
12	AP(N1) = 999999., (FMT, see cards 8 and 11)	Atmosphere data terminator.

Begin shot-time wind data input via Subroutine SHWIND. These winds are used to account for effects of wind shear on the cloud rise, and to advect fallout parcels during cloud rise and stabilization.

Card No.	Variables and Format	Data Description
13	FORM (6X, A4)	Two options are allowed:* FORM ≡ WINDΔΔMETEOROLOGICAL (cols. 1 - 20) for wind data in meteorological format; that is in terms of: altitude, speed, and angle (clockwise from north) from which the wind is coming. FORM ≡ WINDΔΔRESOLVED (cols. 1 - 14) for wind data in resolved form; that is in terms of altitude and x(west to east) and y(south to north) wind components.
14	FMT(12), (12A6)	Wind data object-time format (see cards 17)
15	SCALE(5), (8F10.)	Wind data scale factors. Default values for SCALE(1) through SCALE(3) = 1.0. (See cards 17)
16	N1,N2,N3, (20I4)	Wind data input field pointers. (See cards 17)

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*Here and elsewhere in this section the symbol Δ indicates a blank column in a punched card.

Card No.	Variables and Format	Data Description
17:1 . . . . . 17:[illegible]	AP(3), (FMT, see card 14) . . . . AP(3)	For FORM ≡ WINDΔΔMETEOROLOGICAL (card 13): Altitude (m) = (AP(N1) + SCALE(4)) * SCALE(1) (relative to sea level) VX(m s^{-1}) = AP(N3) * SCALE(2) * SIN(π/180.(AP(N2) * SCALE(3) + SCALE(3) * SCALE(5) - 180.)) VY(m s^{-1}) = AP(N3) * SCALE(2) * COS(π/180.(AP(N2) * SCALE(3) + SCALE(3) * SCALE(5) - 180.)) For FORM ≡ WINDΔΔRESOLVED (card 13): Altitude (m) = same as above. VX(m s^{-1}) = AP(N2) * SCALE(2) VY(m s^{-1}) = AP(N3) * SCALE(2) Here VX and VY are wind components in the west-to-east and south-to-north directions respectively; the scale factors, SCALE(I), are from card 15 and the field pointers, N1, N2, N3, are from card 16.
18	AP(N1) = 999999. (FMT, see cards 14 and 17)	Wind data terminator.

3.2 DIFFUSIVE TRANSPORT MODULE CARD DESCRIPTIONS

Card No	Variables and Format	Data Description
1	DTMID(12), (12A6)	DTM run identification
2	MC(20), (20I4)	Control integers:

I	MC(I)	Action
1	0	Wind field is horizontally homogeneous (i.e., not spatially resolved in the horizontal). At any time, the wind field is defined by a single vertical profile of two-dimensional vectors; vertical wind components are taken to be zero.
	IF(MC(1).NE.0)	The wind field is resolved in three dimensions, and three-dimensional wind vectors are considered.
2	0	Print raw and processed wind and turbulence data before weighted sums (I, eq. (3.2.2)) are computed.
	1	Do not print above.
	2	Print above (i.e., as though MC(2)=0) plus print the data after weighting and summing (I, eq. (3.2.2)). The latter includes weighted-summed vector orientation angles (I, sec. 3.4).

Card No.	Variables and Format	Data Description		
2 (con't.)	MC(20), (20I4)	Control integers:		
		I	MC(I)	Action
		3	0	Do not print fallout parcel descriptions before and after transport.
			IF(MC(3).GT.0)	Print fallout parcel descriptions before transport.
			IF(MC(3).GT.1)	Print deposit increment descriptions.
		4	0	Quick transport is specified (I, sec. 3.2.2)
			1	Layer-by-layer transport is specified (I, sec. 3.2.1)
		5	IF(MC(5).NE.1)	Suppresses debug print from Subroutine TRANP.
			1	Causes debug print from Subroutine TRANP. Caution: this print is voluminous.
		6	0	Sets ratio of the Lagrangian time scale of turbulence to the Eulerian length scale of turbulence, T_L/D_E, to unity in the settling speed correction for turbulent dispersion. This option gives realistic results.
			1	Sets $T_L/D_E = \beta/\sigma_W$ where $\beta = 4$ and σ_W is standard deviation of vertical turbulence. (I, sec. 3.3)
3	ICX, JCX, NSEQ, (20I4)	ICX = number of subdivisions along the x(west-east) axis of the wind field horizontal space resolution "control" net (Appendix A) JCX = same as ICX but for the y(south-north) axis. NSEQ = sequence number of the first fallout parcel to be processed in the parcel descriptions list supplied by the ICRM. Parcels ahead of the NSEQth parcel in the list are bypassed. Default values are unity for all three parameters. For a horizontally homogeneous wind field, this card is normally blank.		
4	WINT,XLLC,YLLC, TIMEH, EDDY, (8F10.0)	WINT = grid spacing of the wind field horizontal space resolution "control" net (Appendix A). For a horizontally homogeneous wind field, specify a large number (e.g., 1.0E10). XLLC = YLLC coordinates of the southwest corner of the atmospheric transport space (i.e., horizontal "control" net) in the west-to-east and south-to-north directions respectively. (Appendix A). For a horizontally homogeneous wind field specify large negative numbers consistent with WINT (e.g., -0.5E10, -0.5E10) TIMEH= transport time limit (hrs.). EDDY = ratio of Lagrangian to Eulerian turbulence time scales β (see card 2, MC(6) = 1, and I, footnote p. 35). Default value = 4. Normally this field is blank.		

DTM Card Descriptions

Card No.	Variables and Format	Data Description
	Cards 1 - 4 are read by Subroutine DTMINT. Begin wind and turbulence data for a horizontally homogeneous wind field read by Subroutines DATIN and ONEDIN (MC(1) = 0). Vertical components are not considered.	
5h	SPEC, FORM, LTIM, UPTIMH, (A4, 2X, A4, 18X, I2, F10.0)	SPEC is used to distinguish wind data from turbulence data and to terminate the input of data sets. FORM distinguishes two types of wind data: meteorological and resolved (see ICRM card 13), and two modes of turbulence data specification: card input and calculate by Wilkins' method (I, sec. 3.3). The options for SPEC and FORM are punched as: WINDΔΔMETEOROLOGICAL (Cols. 1 -20) WINDΔΔRESOLVED (Cols. 1 - 14) TURBΔΔWILKINSΔMETHOD (Cols. 1 - 20) TURBΔΔINPUTΔDATA (Cols. 1 - 16) NOΔMOREΔDATA (Cols. 1 - 12) The NO MORE DATA card is the last DTM input card. LTIM = wind or turbulence field update sequence integer. The shot-time field is update number 1. LTIM = 1 winds must be input first (Cols. 29 - 30). UPTIMH = time (hrs.) at which update LTIM begins. (Note: For each wind update there must be a turbulence update.)
6h	FMT(12), (12A6)	Object-time format for wind or turbulence data. (See cards 9h)
7h	SCALE(5), (8F10.0)	Data scale factors. Default values for SCALE(1) through SCALE(3) = 1.0. (See cards 9h.)
8h	N1, N2, N3	Data input field pointers. (See cards 9h.)
9h:1 . . . . . 9h:KBH	AP(3), (FMT, see card 6h) . . . . AP(3)	For both wind and turbulence data, the processing is as for ICRM cards 13 - 17. Turbulence data must be specified as FORM ≡ INPUTΔDATA (card 5h); it must be input in the resolved format, and after processing must consist of turbulence energy density dissipation rates, ε, (m^2 s^{-3}) (I, sec. 3.3).
10h	AP(N1) = 999999., (FMT, see cards 6h and 9h)	Data set terminator.
	Cards 5h through 10h are repeated for each wind update, and for each turbulence field for which FORM ≡ INPUT DATA (card 5h).	
	Begin data to define the three-dimensional wind and turbulence field grid. (MC(1).NE.0) The same space grid is used for all updates. Data read by Subroutines GETUP and LAYERS.	

DTM Card Descriptions

Card No.	Variables and Format	Data Description
5r:1	MARY(1), MARY(2),. .	Horizontal space resolution net mesh subdivision flags. (Appendix A)
⋮	⋮	
5r:N	..., MARY(MARX),(36I2)	
6r	TLAYR, (11X, A4)	Indicates whether the data to follow represent base or center altitudes of the atmosphere vertical strata: WINDΔLAYERΔCENTERΔALTITUDES (Cols. 1 -27) or WINDΔLAYERΔBASEΔALTITUDES (Cols. 1 - 25)
7r:1	ZCH(1), ZCH(2),...	Vertical strata base or center altitudes (m relative to sea level) as indicated on card 6r.
⋮	⋮	
7r:N	..., ZCH(KBHX), 999999., (8F10.0)	

Begin data for the three-dimensionally resolved wind and turbulence fields. Three-dimensional wind vectors are considered (MC(1).NE.0).
Data read by Subroutines DATIN and TRIDIN.

Card No.	Variables and Format	Data Description
8r	SPEC, FORM, LTIM, UPTIMH (A4, 2X, A4, 18X, I2, F10.0)	Same as card 5h
9r	ALPHA, BETA, NN, (2F10.0, I4)	ALPHA = vertical limiting distance used by the interpolation method which fills in the three-dimensional atmospheric space grid cells from the data to follow (corresponds to α in I, eq. (3.5.2)) BETA = same as ALPHA but for the horizontal plane. NN = number of nearest data vectors used by the interpolation method in filling in the atmospheric space grid cells from the data to follow (corresponds to N in I, eqs. (3.5.1) and (3.5.2)).
10r	FMT(12), (12A6)	Object-time format for wind or turbulence data. (See cards 13r)
11r	SCALE(8), (8F10.0)	Data scale factors. Default values for SCALE(1) through SCALE(3) and SCALE(6) = 1.0. (See cards 13r)
12r	N1, N2, N3, N4, N5, N6, (20I4)	Data input field pointers. (See cards 13r)

Card No.	Variables and Format	Data Description
13r:1 . . . . . 13r:J	AP(6), (FMT, see card 10r) . . . . AP(6)	z (m, altitude relative to sea level) = (AP(N1)+SCALE(4))*SCALE(1) x (m, in west to east direction) = (AP(N5)+SCALE(7))*SCALE(6) y (m, in south to north direction) = (AP(N6)+SCALE(8))*SCALE(6) vertical wind component (m s^{-1}) = AP(N4)*SCALE(2) For FORM ≡ METEOROLOGICAL: VX(m s^{-1}) = AP(N3)*SCALE(2)*SIN(π/180.(AP(N2)*SCALE(3)+ SCALE(5)*SCALE(3) -180.)) VY(m s^{-1}) = AP(N3)*SCALE(2)*COS(π/180.(AP(N2)*SCALE(3)+ SCALE(5)*SCALE(3) -180.)) For FORM ≡ RESOLVED: VX(m s^{-1}) or DX(m^2s^{-3}) = AP(N2)*SCALE(2) VY(m s^{-1}) or DY(m^2s^{-3}) = AP(N3)*SCALE(2) Turbulence data must be specified by FORM ≡ INPUTΔDATA (see cards 5h and 8r); it must be in the resolved format, and after processing must consist of turbulence energy density dissipation rates, ε, (m^2sec^{-3}). Vertical turbulence components are not used.
14r	AP(N1) = 999999., (FMT, see cards 10r and 13r)	Data set terminator.

Cards 8r through 14r are repeated for each wind update and for each turbulence field for which FORM ≡ INPUTΔDATA (Card 8r).

Begin specification of turbulence field to be calculated by Wilkins method. Applies to homogeneous and nonhomogeneous data fields (MC(1) = 0 and MC(1).NE.0), and the turbulence is horizontally isotropic. (I, sec. 3.3).
Data are read by Subroutines DATIN and WILKNS.

Card No.	Variables and Format	Data Description
5t	SPEC, FORM, LTIM, UPTIMH, (A4, 2X, A4, 18X, I2, F10.0)	Same as cards 5h and 8r except that SPEC and FORM are limited to: TURBΔΔWILKINSΔMETHOD (Cols. 1 - 20)
6t	U, ZM, ZO, RL, (4F10.0)	U = surface wind speed (m s^{-1}) ZM = height above ground (m) at which U is measured (usually 10m). ZO = aerodynamic surface roughness length (m) RL = reciprocal of Monin-Obukhov length (m^{-1}) These quantities are used to compute ε as a function of altitude by eq. (I, 3.3.4). On default (blank card), ε is computed as a function of height by eq. (I, 3.3.5).

Cards 5t and 6t are repeated for each update for which turbulence is to be calculated by Wilkins' method.

DTM data input is terminated by a card of type 5h, 8r, 5t with SPEC ≡ NOΔMOREΔDATA (Cols. 1 - 12).

3.3 OUTPUT PROCESSOR MODULE CARD DESCRIPTIONS

Card No.	Variables and Format	Data Description
1	OPMID(12), (12A6)	OPM run identification.
2	IC(20), (20I4)	Control Integers:

I	IC(I)	Action
1	IF(IC(1).GT.0)	Do not call PAM1 or PAM1A to perform the time invarient part of the particle activity calculation and stop after preliminary processing and printout.
2	IF(IC(2).GT.0)	Print all of the deposit increment descriptions received from the DTM.

Card No.	Variables and Format	Data Description
3	NPRNT(6), NPRNT(7), NPRNT(9)→NPRNT(13), NPRNT(15), (8L1)	Particle activity calculation data print control:

Index	Printout if NPRNT(Index) = true
6	Refractory Fractions (FR)
7	Square Root of FR (BSUBK)
9	Nuclide Abundances (Warning - This option combined with JD = FALSE will bury you in paper)
10	Fission Product Activity vs. Part Size (Warning - see 9)
11	Induced Activity (Soil) vs. Part Size (Warning - see 9)
12	Induced Activity (Mass 239) vs. Part Size (Warning - see 9)
13	Selected Mass Chain Activity vs. Part Size

The array FP of total activity with particle size is printed if NPRNT(15) = false. Normally this card is blank.

Card No.	Variables and Format	Data Description
4	FISSID, EMITN, CAPFIS, (A6, 4X, 2F10.3)	FISSID = fission type. One of the twelve types listed on p. 43 of Vol. I. For example, FISSID = U235HE (Cols. 1 - 6). EMITN = number of neutrons produced per fission. Used to compute induced activity in soil fallout. Applicable only to continental (siliceous) soils. IF(EMITN.LE.0.0) induced activity is not computed. CAPFIS = number of neutrons captured by ^{238}U per fission. Used to compute induced activity in device material. Not applicable unless FISSID specifies a ^{238}U type of fission. IF(CAPFIS.EQ.0.0) induced activity in ^{238}U is not computed.

- -

Cards 1 to 4 are read by Subroutine OPM1.
Begin fallout map specification data read by Subroutine OPM2. (sec. 2.4 through 2.6)

- -

OPM Card Descriptions

Card No.	Variables and Format	Data Description
5	XMIN,XMAX,YMIN,YMAX, DGX,DGY,GRUFF, (7F10.3)	XMIN XMAX are the minimum and maximum map coordinates (m) in the west-to-east direction. YMIN YMAX are the minimum and maximum map coordinates (m) in the south-to-north direction (m). DGX DGY are the map grid intervals (m) in the west-east and south-north directions respectively. If DGY is not specified, it is computed by the program to produce a spatially undistorted map (sec. 2.4). GRUFF = a combined ground roughness-survey instrument correction factor sometimes applied to calculated map ordinate values. To compare calculated with observed test shot activity data observed over land, GRUFF ≈ 0.5. Default value = 1.0. (sec. 2.4)
6	NREQ,JC,ICONT,MASCHN, T1,T2,QCUT,CUTMAP, (4I5,4F10.0)	Map request card. A map with geometry as specified on the preceding card 5 is computed and printed according to: NREQ = map request option code. (See Table 3.) JC = 0 or 1, print the map with the two-line E format JC = 2, print the map with the two-line F11.3 format (sec. 2.4) ICONT ≤ 0 do not compute contour points and do not read cards 7 and 8. ICONT = 1 print and punch x,y map coordinate points on the contours specified on card 7, providing a nonblank label is specified on card 8. ICONT > 1 compute and print x,y map coordinate points on the contours specified on card 7 provided a nonblank label is entered on card 8. Do not punch the data. Applicable only to maps that can be wholly contained by the ordinate array OMAP(NMAP). MASCHN Atomic mass number of the mass chain for which activity is to be calculated. Applicable only for NREQ = 14. (See Table 3.) T1,T2 time range (hrs relative to detonation) or particle diameter range (μm) for activity or other calculations. (See Table 3.) QCUT threshold value for acceptance of a contribution at any map point from an individual fallout deposit increment. Computed by the program if not specified. CUTMAP threshold value for print of a completed map ordinate value. Computed by the program if not specified.
7	CONTUR(8),(8F10.0)	Read only if ICONT.NE.0 (card 6). Values of activity or other quantity, depending on type of map, for which map x,y coordinates are to be printed and punched. These data can be used for contour plotting. A maximum of eight values are allowed per map. Restricted to maps that can be wholly contained in the ordinate array OMAP(NMAP). (sec. 2.6)

Card No.	Variables and Format	Data Description
8	CRDLBL,(A10)	Read only if ICONT.NE.0 (Card 6). Label to be punched in each contour card resulting from the card 7 specifications. Print and punch of these data will not occur unless a nonblank label is specified.

- -

Card 6, and cards 7 and 8 if necessary, are repeated for as many maps as desired with the geometry specified by the preceding card 5; a blank card 6 terminates map production for this geometry.

- -

Card 5 is repeated to define a new map geometry, and is followed by a set of cards 6 and cards 7 and 8 if necessary. The run is terminated by a blank card 5.

- -

3.4 PAM TAPE DATA

Fission yield data are input to the Particle Activity Submodule (Subroutine PAM1) from external unit INPAM (Table 1). The data are in twelve blocks of 692 words, each block preceded by a six-character fission-type identification corresponding to the twelve FISSID designations. (See I, sec. 4.1 and OPM card 4.) Formats are (A6) and (5E14.6). The data are listed in Appendix C.

4. TEST PROBLEM

4.1 CARD INPUT

```
ICRM
Card
No.   1234567890123456789012345678901234567890123456789012345678901234567890123456789 0
 1     DELFIC TEST PRØBLEM - ICRM
 2                    3
 3     50.        50.                 139.
 4      30
 5
 6
 7    TEST PRØBLEM ATMØSPHERE
 8    (4F10.0,2F1.0)
 9                         100.                                              273.16
10       1   2   3   4   5   6
```

ICRM Card No.	Altitude(m)	Temperature(°C)	Pressure(mb)	Relative Humidity%
11	216.	8.2	1000.	53.
	1548.	3.4	850.	70.
	3097.	-6.7	700.	78.
	5688.	-15.7	500.	19.
	7327.	-30.3	400.	55.
	9309.	-47.1	300.	
	10488.	-56.5	250.	
	11887.	-60.5	200.	
	13698.	-57.1	150.	
	16267.	-56.5	100.	
	18526.	-56.5	70.	
	20665.	-56.5	50.	
	23902.	-57.7	30.	
	26493.	-53.7	20.	
	31023.	-45.5	10.	
12	99999.			
13	WIND METEØRØLØGICAL			
14	(F12.0,24X,2F12.0)			
15				
16	1 2 3			

ICRM Card No.	Altitude(m)	Direction Angle(deg.)	Speed(m s⁻¹)
17	216.	140.	8.
	1549.	155.	13.
	3097.	190.	5.
	5688.	200.	15.
	7327.	215.	19.
	9309.	220.	16.
	10488.	215.	11.
	11887.	220.	13.
	13698.	235.	12.
	16267.	250.	9.
	18526.	275.	7.
	20665.	275.	7.
	23902.	280.	11.
	26493.	270.	11.
	31023.	275.	25.
18	999999.		

DTM Card No.	Card contents
1	DELFIC TEST PRØBLEM - DTM
2	
3	
4	1.E10 -0.5E10 -0.5E10 48.
5h	WIND METEØRØLØGICAL 1
6h	(F12.0,24X,2F12.0)
7h	
8h	1 2 3

DTM Card No.	Altitude (m) (cols 1–6)	Direction Angle (deg.)	Speed (m s^{-1})
9h	216.	140.	8.
	1548.	155.	13.
	3097.	190.	5.
	5688.	200.	15.
	7327.	215.	19.
	9309.	220.	16.
	10488.	215.	11.
	11887.	220.	13.
	13698.	235.	12.
	16267.	250.	9.
	18526.	275.	7.
	20665.	275.	7.
	23902.	280.	11.
	26493.	270.	11.
	31023.	275.	25.
10h	99999.		
5t	TURB WILKINS		
6t			
5h	NØ MØRE DATA		

OPM Card No.	Card contents
1	DELFIC TEST PRØBLEM - ØPM
2	
3	
4	P239HE 1.4
5	-9000. 14400. -3000. 51000. 1800.
6	2
6	
5	

4.2 PRINTED OUTPUT

```
                              * * * * * * * * * *

                                  D E L F I C

  T H E   D E P A R T M E N T   O F   D E F E N S E   F A L L O U T   P R E D I C T I O N   S Y S T E M

                              * * * * * * * * * *


                     INITIALIZATION AND CLOUD RISE MODULE

                                  PREPARED BY
                         ATMOSPHERIC SCIENCE ASSOCIATES
                                BEDFORD, MASS.


     ****  RUN IDENTIFICATION  ****    DELFIC TEST PROBLEM - ICRM

   ****  THE CONTROL VARIABLE ARRAY, IC(J), HAS GIVEN THE FOLLOWING VALUES  ****
   0   0   0   3   0   0   1   0   0   0   0   0   0   0   0   0   0   0   0


     ****  BASIC PARAMETERS  ****
 YIELDS - TOTAL (FISSION)                      .50000E+02 (  .50000E+02) KT
 HEIGHT OR DEPTH OF BURST                     0.          METERS ( 0.          FEET) RELATIVE TO GZ
 ALTITUDE OF GZ                                .13900E+03 METERS
 SOIL CATEGORY                                SILICEOUS


     ****  INITIAL CLOUD PROPERTIES AT H +  .43571E+01 SECONDS  ****
 AVERAGE GAS TEMPERATURE                                            .2628       DEGREES KELVIN
 AVERAGE TEMPERATURE OF CONDENSED PHASE MATERIAL IN CLOUD           .13         DEGREES KELVIN
 MASS OF VAPORIZED SOIL IN CLOUD                                   0.           KILOGRAMS
 MASS OF CONDENSED PHASE MATERIAL IN CLOUD                          .284        KILOGRAMS
 SCALED HEIGHTS OF BURST                                           0.          FEET ( 0.          METERS)
 FRACTION OF THE TOTAL EXPLOSION ENERGY IN THE CLOUD AT THE INITIAL TIME = .4500
 FRACTION OF THIS ENERGY USED TO HEAT AIR AND SOIL =1.0000
 FRACTION  USED TO HEAT LIQUID WATER =0.0000
 FALLOUT SOLIDIFICATION TEMPERATURE = 2200.000 (K)
 DETONATION COORDINATES          XGZ                YGZ                TGZ
                          0.                 0.                 0.
 FALLOUT PARTICLE DENSITY                      .26000E+04 KG/M**3
```

```
PARTICLE SIZE FREQUENCY DISTRIBUTION
     A LOG-NORMAL DISTRIBUTION WITH -
          MEDIAN DIAMETER                            .40700E+00  MICROMETERS
          GEOMETRIC STANDARD DEVIATION               .40000E+01
     THIS DISTRIBUTION WAS SPECIFIED BY              THE PROGRAM

PARTICLE VOLUME FREQUENCY DISTRIBUTION
     A LOG-NORMAL DISTRIBUTION WITH -
          MEDIAN DIAMETER                            .12956E+03  MICROMETERS
          GEOMETRIC STANDARD DEVIATION               .40000E+01

PARTICLE SIZE - MASS DISTRIBUTION TABLE (DIAMETERS ARE IN METERS)
NUMBER OF PARTICLE SIZE CLASSES =  30
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	DIAMETER	LOWER BOUNDRY	FRACTION	UPPER BOUNDARY
1	.24836E-02	.16514E-02	.33333E-01	.37331E-02
2	.13111E-02	.10409E-02	.33333E-01	.16514E-02
3	.89391E-03	.76756E-03	.33333E-01	.10409E-02
4	.68190E-03	.60573E-03	.33333E-01	.76756E-03
5	.54839E-03	.49648E-03	.33333E-01	.60573E-03
6	.45499E-03	.41696E-03	.33333E-01	.49648E-03
7	.38334E-03	.35611E-03	.33333E-01	.41696E-03
8	.33110E-03	.30784E-03	.33333E-01	.35611E-03
9	.28751E-03	.26852E-03	.33333E-01	.30784E-03
10	.25163E-03	.23558E-03	.33333E-01	.26852E-03
11	.22154E-03	.20813E-03	.33333E-01	.23558E-03
12	.19591E-03	.18440E-03	.33333E-01	.20813E-03
13	.17381E-03	.16382E-03	.33333E-01	.18440E-03
14	.15454E-03	.14579E-03	.33333E-01	.16382E-03
15	.13760E-03	.12986E-03	.33333E-01	.14579E-03
16	.12257E-03	.11568E-03	.33333E-01	.12986E-03
17	.10913E-03	.10295E-03	.33333E-01	.11568E-03
18	.97031E-04	.91456E-04	.33333E-01	.10295E-03
19	.86085E-04	.81029E-04	.33333E-01	.91456E-04
20	.76126E-04	.71520E-04	.33333E-01	.81029E-04
21	.67022E-04	.62807E-04	.33333E-01	.71520E-04
22	.58659E-04	.54784E-04	.33333E-01	.62807E-04
23	.50936E-04	.47359E-04	.33333E-01	.54784E-04
24	.43767E-04	.40447E-04	.33333E-01	.47359E-04
25	.37067E-04	.33969E-04	.33333E-01	.40447E-04
26	.30753E-04	.27842E-04	.33333E-01	.33969E-04
27	.24732E-04	.21969E-04	.33333E-01	.27842E-04
28	.18866E-04	.16202E-04	.33333E-01	.21969E-04
29	.12863E-04	.10212E-04	.33333E-01	.16202E-04
30	.67923E-05	.45176E-05	.33333E-01	.10212E-04

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CLOUD SUBDIVISION PARAMETERS -
   NUMBER OF CLOUD SUBDIVISIONS IN THE VERTICAL (KDI) =  8
   PARCEL HORIZONTAL SUBDIVISION PARAMETER (TRAD) =  0

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LEAVING ICM
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ATMOSPHERE IDENTIFICATION - TEST PROBLEM ATMOSPHERE

ATMOSPHERE

ALT	ATP	PRS	RLH	RHO	ETA
-.60000E+03	.29205E+03	.10987E+06	.77000E+02	.12982E+01	.18061E-04
0.	.28815E+03	.10137E+06	.77000E+02	.12253E+01	.17894E-04
.60000E+03	.28029E+03	.95613E+05	.59295E+02	.11862E+01	.17512E-04
.12000E+04	.27793E+03	.88695E+05	.55070E+02	.11121E+01	.17396E-04
.18000E+04	.27462E+03	.82731E+05	.73608E+02	.10466E+01	.17233E-04
.24000E+04	.27085E+03	.75842E+05	.74028E+02	.98553E+00	.17045E-04
.30000E+04	.26707E+03	.70952E+05	.77447E+02	.92444E+00	.16858E-04
.36000E+04	.26493E+03	.66275E+05	.64401E+02	.86923E+00	.16750E-04
.42000E+04	.26278E+03	.61599E+05	.51355E+02	.81397E+00	.16642E-04
.48000E+04	.26063E+03	.56922E+05	.38708E+02	.75874E+00	.16534E-04
.54000E+04	.25849E+03	.52245E+05	.25262E+02	.70750E+00	.16425E-04
.60000E+04	.25432E+03	.48211E+05	.28808E+02	.65940E+00	.16211E-04
.66000E+04	.24914E+03	.44498E+05	.40651E+02	.62185E+00	.15944E-04
.72000E+04	.24396E+03	.40786E+05	.52453E+02	.58231E+00	.15677E-04
.78000E+04	.23887E+03	.37717E+05	.37595E+02	.54829E+00	.15407E-04
.84000E+04	.23377E+03	.34049E+05	.22625E+02	.51427E+00	.15137E-04
.90000E+04	.22868E+03	.31590E+05	.75911E+01	.48026E+00	.14868E-04
.96000E+04	.22378E+03	.28832E+05	.18705E+01	.44824E+00	.14603E-04
.10200E+05	.21897E+03	.26243E+05	.61064E+00	.41723E+00	.14342E-04
.10800E+05	.21610E+03	.23933E+05	.13554E+00	.38565E+00	.14185E-04
.11400E+05	.21420E+03	.21762E+05	.60707E-01	.35379E+00	.14081E-04
.12000E+05	.21326E+03	.19755E+05	.97422E-02	.32302E+00	.14029E-04
.12600E+05	.21425E+03	.18075E+05	.62739E-02	.29442E+00	.14084E-04
.13200E+05	.21524E+03	.16394E+05	.28455E-02	.26581E+00	.14138E-04
.13800E+05	.21596E+03	.14879E+05	.51797E-03	.24031E+00	.14178E-04
.14400E+05	.21613E+03	.13692E+05	.39199E-03	.22101E+00	.14187E-04
.15000E+05	.21630E+03	.12505E+05	.26602E-03	.20170E+00	.14197E-04
.15600E+05	.21647E+03	.11319E+05	.14004E-03	.18240E+00	.14206E-04
.16200E+05	.21664E+03	.10133E+05	.14067E-04	.16309E+00	.14216E-04
.16800E+05	.21665E+03	.93245E+04	.10439E-04	.15008E+00	.14216E-04
.17400E+05	.21665E+03	.85164E+04	.69099E-05	.13707E+00	.14216E-04
.18000E+05	.21666E+03	.77284E+04	.11812E-05	.12405E+00	.14216E-04
.18600E+05	.21666E+03	.69781E+04	.63474E-06	.11231E+00	.14217E-04
.19200E+05	.21666E+03	.64334E+04	.43288E-06	.10305E+00	.14217E-04
.19800E+05	.21666E+03	.58256E+04	.29162E-06	.93805E-01	.14217E-04
.20400E+05	.21666E+03	.52538E+04	.89156E-07	.84554E-01	.14217E-04
.21000E+05	.21651E+03	.48124E+04	.19219E-07	.77483E-01	.14209E-04
.21600E+05	.21630E+03	.44377E+04	.15246E-07	.71501E-01	.14197E-04
.22200E+05	.21608E+03	.40630E+04	.11272E-07	.65519E-01	.14185E-04
.22800E+05	.21586E+03	.36883E+04	.72993E-08	.59537E-01	.14173E-04
.23400E+05	.21564E+03	.33135E+04	.33246E-08	.53555E-01	.14161E-04
.24000E+05	.21579E+03	.29347E+04	.62535E-09	.48246E-01	.14169E-04
.24600E+05	.21667E+03	.27477E+04	.47485E-09	.44762E-01	.14217E-04
.25200E+05	.21756E+03	.25107E+04	.32434E-09	.40319E-01	.14266E-04

.25600E+05	.21844E+03	.22737E+04	.17763E-09	.36755E-01	.14314E-04
.26400E+05	.21932E+03	.20557E+04	.23328E-10	.32391E-01	.14363E-04
.27000E+05	.22041E+03	.19822E+04	.20301E-10	.30175E-01	.14421E-04
.27600E+05	.22149E+03	.17675E+04	.17273E-10	.27959E-01	.14480E-04
.28200E+05	.22257E+03	.16731E+04	.14245E-10	.25743E-01	.14539E-04
.28800E+05	.22365E+03	.14835E+04	.11218E-10	.23527E-01	.14597E-04
.29400E+05	.22473E+03	.13640E+04	.81699E-11	.21311E-01	.14656E-04
.30000E+05	.22582E+03	.12294E+04	.51622E-11	.19095E-01	.14715E-04
.30600E+05	.22690E+03	.10949E+04	.21345E-11	.16878E-01	.14773E-04
.31200E+05	.22807E+03	.99542E+03	.42105E-01	.15250E-01	.14836E-04
.31800E+05	.22943E+03	.96619E+03	.16842E+00	.14796E-01	.14906E-04
.32400E+05	.23079E+03	.93697E+03	.29474E+00	.14342E-01	.14976E-04
.33000E+05	.23215E+03	.90775E+03	.42105E+00	.13888E-01	.15047E-04
.33600E+05	.23351E+03	.87853E+03	.54737E+00	.13434E-01	.15117E-04
.34200E+05	.23487E+03	.84931E+03	.67368E+00	.12980E-01	.15187E-04
.34800E+05	.23622E+03	.82013E+03	.80000E+00	.12526E-01	.15257E-04
.35400E+05	.23758E+03	.79086E+03	.92632E+00	.12072E-01	.15328E-04
.36000E+05	.23894E+03	.76164E+03	.10526E+01	.11618E-01	.15398E-04
.36600E+05	.24030E+03	.73241E+03	.11789E+01	.11164E-01	.15468E-04
.37200E+05	.24166E+03	.70319E+03	.13053E+01	.10711E-01	.15538E-04
.37800E+05	.24302E+03	.67397E+03	.14316E+01	.10257E-01	.15609E-04
.38400E+05	.24438E+03	.64475E+03	.15579E+01	.98027E-02	.15679E-04
.39000E+05	.24574E+03	.61552E+03	.16842E+01	.93488E-02	.15749E-04
.39600E+05	.24710E+03	.58630E+03	.18105E+01	.88949E-02	.15819E-04
.40200E+05	.24845E+03	.55708E+03	.19368E+01	.84410E-02	.15890E-04
.40800E+05	.24981E+03	.52786E+03	.20632E+01	.79871E-02	.15960E-04
.41400E+05	.25117E+03	.49863E+03	.21895E+01	.75331E-02	.16030E-04
.42000E+05	.25253E+03	.46941E+03	.23158E+01	.70792E-02	.16100E-04
.42600E+05	.25389E+03	.44019E+03	.24421E+01	.66253E-02	.16171E-04
.43200E+05	.25525E+03	.41097E+03	.25684E+01	.61713E-02	.16241E-04
.43800E+05	.25661E+03	.38174E+03	.26947E+01	.57174E-02	.16311E-04
.44400E+05	.25797E+03	.35252E+03	.28211E+01	.52635E-02	.16381E-04
.45000E+05	.25933E+03	.32330E+03	.29474E+01	.48096E-02	.16452E-04
.45600E+05	.26068E+03	.29408E+03	.30737E+01	.43557E-02	.16522E-04
.46200E+05	.26204E+03	.26485E+03	.32000E+01	.39017E-02	.16592E-04
.46800E+05	.26340E+03	.23563E+03	.33263E+01	.34478E-02	.16662E-04
.47400E+05	.26476E+03	.20641E+03	.34526E+01	.29939E-02	.16733E-04
.48000E+05	.26612E+03	.17719E+03	.35789E+01	.25400E-02	.16803E-04
.48600E+05	.26748E+03	.14796E+03	.37053E+01	.20861E-02	.16873E-04
.49200E+05	.26884E+03	.11874E+03	.38316E+01	.16321E-02	.16943E-04
.49800E+05	.27020E+03	.89527E+02	.39579E+01	.11782E-02	.17014E-04

SHOT-TIME WIND DATA

RAW DATA			PROCESSED DATA		
Z	VX OR DIR.	VY OR SPEED	Z	VX	VY
2.16000E+02	1.40000E+02	8.00000E+00	2.16000E+02	-5.14230E+00	6.12836E+00
1.54800E+03	1.55000E+02	1.30000E+01	1.54800E+03	-5.49404E+00	1.17820E+01
3.39700E+03	1.90000E+02	5.00000E+00	3.39700E+03	8.68241E-01	4.92404E+00
5.68800E+03	2.00000E+02	1.50000E+01	5.68800E+03	5.13030E+00	1.40954E+01
7.32700E+03	2.15000E+02	1.90000E+01	7.32700E+03	1.08980E+01	1.55639E+01
9.30900E+03	2.20000E+02	1.60000E+01	9.30900E+03	1.02846E+01	1.22567E+01
1.04880E+04	2.15000E+02	1.10000E+01	1.04880E+04	6.30934E+00	9.01067E+00
1.18870E+04	2.20000E+02	1.30000E+01	1.18870E+04	8.35624E+00	9.95858E+00
1.36980E+04	2.35000E+02	1.20000E+01	1.36980E+04	9.82982E+00	6.88292E+00
1.62670E+04	2.50000E+02	9.00000E+00	1.62670E+04	8.45723E+00	3.07818E+00
1.85260E+04	2.75000E+02	7.00000E+00	1.85260E+04	6.97336E+00	-6.10090E-01
2.06650E+04	2.75000E+02	7.00000E+00	2.06650E+04	6.97336E+00	-6.10090E-01
2.39020E+04	2.80000E+02	1.10000E+01	2.39020E+04	1.08329E+01	-1.91013E+00
2.64930E+04	2.70000E+02	1.10000E+01	2.64930E+04	1.10000E+01	1.97438E-08
3.10230E+04	2.75000E+02	2.50000E+01	3.10230E+04	2.49049E+01	-2.17889E+00

CLOUD RISE IS TERMINATED IN CXPN AT STATEMENT 443 BY THE U,EK SWITCH

CLOUD RISE AND GROWTH HISTORY FOR RUN *** DELFIC TEST PROBLEM - ICRM

CLOUD HISTORY TABLE

	CLOUD TIME (SEC)	CLOUD INTERVAL (SEC)	CLOUD BASE (M)	CLOUD TOP (M)	CLOUD RADIUS (M)	BASE RATE (M/SEC)	TOP RATE (M/SEC)	RADIAL RATE (M/SEC)	TEMPERATURE (K)	GAS DENSITY (KG/M**3)
1)	.4357E+01	.1875E+00	.2149E+03	.7263E+03	.3866E+03	.6412E+02	.8645E+02	.1688E+02	.2623E+04	.1284E+00
2)	.4545E+01	.4375E+00	.2263E+03	.7425E+03	.3597E+03	.6725E+02	.9061E+02	.1766E+02	.2545E+04	.1323E+00
3)	.4982E+01	.8750E+00	.2563E+03	.7821E+03	.3975E+03	.6877E+02	.9258E+02	.1863E+02	.2233E+04	.1503E+00
4)	.5357E+01	.1250E+01	.3165E+03	.8631E+03	.4132E+03	.6170E+02	.9453E+02	.2482E+02	.1621E+04	.2053E+00
5)	.7107E+01	.1500E+01	.3936E+03	.9813E+03	.4447E+03	.5675E+02	.9050E+02	.2551E+02	.1185E+04	.2770E+00
6)	.8607E+01	.2500E+01	.4737E+03	.1117E+04	.4825E+03	.5516E+02	.8237E+02	.2054E+02	.9221E+03	.3521E+00
7)	.1111E+02	.3000E+01	.6165E+03	.1323E+04	.5339E+03	.5317E+02	.7574E+02	.1706E+02	.6811E+03	.4669E+00
8)	.1411E+02	.3750E+01	.7761E+03	.1554E+04	.5850E+03	.5109E+02	.7101E+02	.1506E+02	.5410E+03	.5739E+00
9)	.1786E+02	.4500E+01	.9677E+03	.1816E+04	.6415E+03	.4909E+02	.6792E+02	.1355E+02	.4537E+03	.6646E+00
10)	.2236E+02	.5500E+01	.1163E+04	.2116E+04	.7075E+03	.4657E+02	.6340E+02	.1273E+02	.3983E+03	.7345E+00
11)	.2786E+02	.6500E+01	.1445E+04	.2467E+04	.7725E+03	.4365E+02	.5963E+02	.1208E+02	.3599E+03	.7842E+00
12)	.3436E+02	.7750E+01	.1728E+04	.2854E+04	.8510E+03	.4070E+02	.5574E+02	.1137E+02	.3329E+03	.8135E+00
13)	.4211E+02	.8750E+01	.2044E+04	.3286E+04	.9391E+03	.3808E+02	.5198E+02	.1051E+02	.3171E+03	.8243E+00
14)	.5186E+02	.1000E+02	.2377E+04	.3741E+04	.1031E+04	.3579E+02	.4832E+02	.9468E+01	.2988E+03	.8204E+00
15)	.6086E+02	.1150E+02	.2735E+04	.4224E+04	.1126E+04	.3283E+02	.4474E+02	.9001E+01	.2877E+03	.8124E+00
16)	.7236E+02	.1300E+02	.3113E+04	.4739E+04	.1229E+04	.2940E+02	.4074E+02	.8575E+01	.2768E+03	.7952E+00
17)	.8536E+02	.1450E+02	.3495E+04	.5268E+04	.1341E+04	.2578E+02	.3640E+02	.8092E+01	.2715E+03	.7711E+00
18)	.9986E+02	.1700E+02	.3857E+04	.5796E+04	.1458E+04	.2164E+02	.3164E+02	.7562E+01	.2656E+03	.7425E+00
19)	.1169E+03	.1750E+02	.4235E+04	.6334E+04	.1587E+04	.1742E+02	.2562E+02	.6955E+01	.2605E+03	.7099E+00
20)	.1344E+03	.2000E+02	.4540E+04	.6860E+04	.1708E+04	.1346E+02	.2158E+02	.6138E+01	.2567E+03	.6813E+00
21)	.1544E+03	.2025E+02	.4830E+04	.7232E+04	.1831E+04	.1009E+02	.1751E+02	.5615E+01	.2534E+03	.6604E+00
22)	.1746E+03	.2500E+02	.5014E+04	.7586E+04	.1945E+04	.7765E+01	.1403E+02	.5041E+01	.2549E+03	.6431E+00
23)	.1996E+03	.2500E+02	.5193E+04	.7937E+04	.2071E+04	.5197E+01	.1119E+02	.4529E+01	.2488E+03	.6257E+00
24)	.2246E+03	.2750E+02	.5323E+04	.8217E+04	.2184E+04	.3510E+01	.8972E+01	.4099E+01	.2471E+03	.6122E+00
25)	.2521E+03	.3000E+02	.5424E+04	.8462E+04	.2297E+04	.2030E+01	.6999E+01	.3719E+01	.2456E+03	.6068E+00
26)	.2821E+03	.3250E+02	.5487E+04	.8672E+04	.2403E+04	.9783E+00	.5315E+01	.3384E+01	.2445E+03	.5917E+00
27)	.3146E+03	.3250E+02	.5514E+04	.8845E+04	.2518E+04	-.2117E+00	.3952E+01	.3071E+01	.2436E+03	.5849E+00
28)	.3471E+03	.3750E+02	.5537E+04	.8970E+04	.2618E+04	-.1199E+01	.2544E+01	.2829E+01	.2431E+03	.5815E+00
29)	.3846E+03	.4000E+02	.5462E+04	.9066E+04	.2734E+04	-.1628E+00	.1738E+00	.3876E+01	.2429E+03	.5802E+00
30)	.4246E+03	.4250E+02	.5453E+04	.9073E+04	.2879E+04	0.	0.	.3879E+01	.2428E+03	.5803E+00
31)	.4671E+03	0.	.5455E+04	.9073E+04	.3044E+04	0.	0.	0.	.2428E+03	.5803E+00

TIME OF SOIL SOLIDIFICATION AT TEMPERATURE 2200.0000 DEG. IS 5.6292 SEC.

CLOUD TRAJECTORY

XC	YC	ZC	TC	VC
-.224053E+02	.267016E+02	.470563E+03	.435707E+01	.752824E+02
-.233695E+02	.278507E+02	.484678E+03	.454457E+01	.789308E+02
-.256193E+02	.305319E+02	.519213E+03	.495217E+01	.306580E+02
-.301185E+02	.358942E+02	.539786E+03	.585707E+01	.781188E+02
-.365467E+02	.435546E+02	.637435E+03	.713707E+01	.776220E+02
-.442601E+02	.527472E+02	.797868E+03	.860707E+01	.687438E+02
-.575647E+02	.752829E+02	.959727E+03	.111071E+02	.544564E+02
-.740469E+02	.110629E+03	.116310E+04	.141071E+02	.510487E+02
-.946495E+02	.154811E+03	.139203E+04	.173571E+02	.580527E+02
-.119073E+03	.207830E+03	.155327E+04	.223571E+02	.549861E+02
-.149590E+03	.272631E+03	.195569E+04	.278571E+02	.516419E+02
-.165391E+03	.349214E+03	.229136E+04	.343571E+02	.482175E+02
-.182681E+03	.391804E+03	.256505E+04	.421071E+02	.450290E+02
-.175084E+03	.434890E+03	.315905E+04	.508571E+02	.420530E+02
-.166401E+03	.484130E+03	.347958E+04	.603571E+02	.387869E+02
-.156417E+03	.543757E+03	.392563E+04	.723571E+02	.350732E+02
-.145129E+03	.604769E+03	.438158E+04	.853571E+02	.310599E+02
-.722385E+02	.865928E+03	.483182E+04	.998571E+02	.266422E+02
.149766E+02	.104555E+04	.528474E+04	.115857E+03	.220158E+02
.104757E+03	.129222E+04	.567001E+04	.134357E+03	.175217E+02
.207363E+03	.157413E+04	.602345E+04	.154357E+03	.138002E+02
.311252E+03	.165956E+04	.629391E+04	.174607E+03	.106996E+02
.471794E+03	.222816E+04	.656739E+04	.196607E+03	.819758E+01
.744243E+03	.260926E+04	.677221E+04	.224607E+03	.622082E+01
.104394E+04	.303727E+04	.694328E+04	.252107E+03	.453959E+01
.137088E+04	.350418E+04	.717947E+04	.282107E+03	.307650E+01
.172505E+04	.401001E+04	.717945E+04	.314607E+03	.182016E+01
.207924E+04	.451584E+04	.723861E+04	.347107E+03	.572723E+00
.248792E+04	.503948E+04	.726384E+04	.384607E+03	.550127E-02
.292383E+04	.572204E+04	.726406E+04	.424607E+03	0.
.338700E+04	.636358E+04	.726406E+04	.467107E+03	0.

```
                         * * * * * * * * * * *

                              D E L F I C

T H E   D E P A R T M E N T   O F   D E F E N S E   F A L L O U T   P R E D I C T I O N   S Y S T E M

                         * * * * * * * * * * *


                      DIFFUSIVE TRANSPORT MODULE


                            PREPARED BY
                    ATMOSPHERIC SCIENCE ASSOCIATES
                           BEDFORD, MASS.


               *****  SUMMARY OF RUN IDENTIFIERS  *****
INITIALIZATION AND CLOUD RISE MODULE IDENTIFICATION -  DELFIC TEST PROBLEM - ICRM
        DIFFUSIVE TRANSPORT MODULE IDENTIFICATION -  DELFIC TEST PROBLEM - DTM

    THE CONTROL VARIABLE ARRAY, MC(J), HAS BEEN GIVEN THE VALUES -
      0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0

              THE TRANSPORT TIME LIMIT IS   172800.000 SEC. (  48.00000 HOURS)
    COORDINATES OF GROUND ZERO (XGZ,YGZ,ZGZ) ARE ( 0.          ,  0.          ,  .13900E+03) (METERS)
                                   DETONATION TIME IS 0.          SECONDS

    HORIZONTAL COORDINATES OF THE SOUTH WEST CORNER OF THE TRANSPORT SPACE ARE ( -.50000E+10,  -.50000E+10)
                         THE RESOLUTION NET SPACING IS    .10000E+11 (ALL IN METERS)
    A PLANE DEPOSITION SURFACE AT ALTITUDE   139.000 (METERS ABOVE MSL) IS ASSUMED

    FALLOUT PARTICLE DENSITY IS   .25000E+04 KG/M**3   THERE ARE   30 PARTICLE SIZE CLASSES

    TRANSPORT IS BY THE QUICK METHOD
```

ATMOSPHERE UPDATE 1 FOR TIMES LATER THAN 0. SEC (0.000 HOURS)

* * * * * * * * * WINDFIELD DATA * * * * * * * * *

RAW WIND DATA			PROCESSED WIND DATA		
Z	VX OR DIR.	VY OR SPEED	Z	VX	VY
2.13000E+02	1.40000E+02	8.30000E+00	2.16000E+02	-5.14236E+00	6.12636E+00
1.54800E+03	1.55000E+02	1.30000E+01	1.54800E+03	-5.49424E+00	1.17820E+01
3.09700E+03	1.90000E+02	5.00000E+00	3.09700E+03	8.68241E-01	4.92404E+00
5.68300E+03	2.00000E+02	1.50000E+01	5.68300E+03	5.17030E+00	1.40954E+01
7.32700E+03	2.15000E+02	1.30000E+01	7.32700E+03	1.08990E+01	1.55639E+01
9.30510E+03	2.20000E+02	1.60000E+01	9.30900E+03	1.02846E+01	1.22567E+01
1.04880E+04	2.15000E+02	1.10000E+01	1.04880E+04	6.30934E+00	9.01067E+00
1.18870E+04	2.23000E+02	1.30000E+01	1.18870E+04	3.35624E+00	9.95858E+00
1.36980E+04	2.35000E+02	1.20000E+01	1.36980E+04	9.82982E+00	6.88292E+00
1.62570E+04	2.50000E+02	9.00000E+00	1.52670E+04	9.45723E+00	3.07818E+00
1.85260E+04	2.75000E+02	7.10000E+00	1.85260E+04	6.97336E+00	-6.10090E-01
2.06650E+04	2.75000E+02	7.10000E+00	2.06650E+04	6.97336E+00	-6.10090E-01
2.39020E+04	2.80000E+02	1.10000E+01	2.39020E+04	1.08329E+01	-1.91013E+00
2.64930E+04	2.70000E+02	1.10000E+01	2.64930E+04	1.10000E+01	1.97438E-08
3.10230E+04	2.75000E+02	2.50000E+01	3.10230E+04	2.49049E+01	-2.17889E+00

WIND LAYER BASE ALTITUDES

LEVELS 1 THRU 8 179.00000 293.00000 2603.00000 3391.00000 7985.00000 6669.00000 11940.00000 9027.00000
LEVELS 9 THRU 15 14747.00000 12649.00000 19685.00000 17167.00000 24163.00000 23641.00000 29745.00000

MAXIMUM WIND SPACE ALTITUDE IS .32701E+05 METERS

ATMOSPHERE UPDATE 1 FOR TIMES LATER THAN 0. SEC (0.000 HOURS)

* * * * * * * * * TURBULENCE DATA * * * * * * * * *

TURBULENCE PARAMETERS ARE CALCULATED BY WILKINS RECIPROCAL ALTITUDE FUNCTION
FOR UPDATE 1 AT 0. SECONDS

K	ZCH	DXSUM	DYSUM
1	.21600E+03	.38961E-03	.33961E-03
2	.15480E+04	.21292E-04	.21292E-04
3	.30970E+04	.10142E-04	.11142E-04
4	.56830E+04	.54064E-05	.54064E-05
5	.73270E+04	.41736E-05	.41736E-05
6	.93090E+04	.32715E-05	.32715E-05
7	.10488E+05	.28988E-05	.23993E-05
8	.11887E+05	.25536E-05	.25536E-05
9	.13698E+05	.22126E-05	.22126E-05
10	.16267E+05	.13601E-05	.13601E-05
11	.18526E+05	.16316E-05	.16316E-05
12	.20665E+05	.14616E-05	.14616E-05
13	.23962E+05	.12625E-05	.12625E-05
14	.26493E+05	.11383E-05	.11383E-05
15	.31023E+05	.97138E-06	.97138E-06

TURBULENCE PARAMETER AVERAGED OVER ALL SPACE FOR UPDATE 1 IS .57080E-05

```
* * * * * * * * * * *

D E L F I C

T H E   D E P A R T M E N T   O F   D E F E N S E   F A L L O U T   P R E D I C T I O N   S Y S T E M

* * * * * * * * * * *


OUTPUT PROCESSOR MODULE


PREPARED BY
ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASS.


**** SUMMARY OF RUN IDENTIFIERS ****
CUTPUT PROCESSOR -  DELFIC TEST PROBLEM - OPM
INITIALIZATION AND CLOUD RISE -  DELFIC TEST PROBLEM - ICRM
DIFFUSIVE TRANSPORT -  DELFIC TEST PROBLEM - DTM

****  THE CONTROL VARIABLE ARRAY, IC(J), WAS GIVEN THE FOLLOWING VALUES  ****
0   1   1   0   0   0   0   0   1   1   0   0   0   0   0   0   0   0   0   0

TOTAL YIELD IS  5.0000E+01 KILOTONS.
FISSION YIELD IS  5.0000E+01 KILOTONS.

TYPE OF FISSION IS P239HE

THE HEIGHT OF BURST IS    0.000 METERS.

SOIL INDUCED ACTIVITY - NEUTRONS EMITTED PER FISSION ARE  1.400

THE CLOUD REACHED THE SOIL CONDENSATION TEMPERATURE OF  2200.0 AT   5.0232 SEC.

THERE ARE  31 PARTICLE CLASSES

PRINTER DESCRIPTION  -  CHARACTERS PER INCH
HORIZONTAL   10          VERTICAL    6
```

**** OUTPUT PROCESSOR TASK 1 ****

GRID LIMITS AND INTERVALS

XMIN	XMAX	YMIN	YMAX	DELTA X	DELTA Y
-9000.	14400.	-7300.	51.00.	1800.00	1500.00

COMBINED GROUND ROUGHNESS-INSTRUMENT RESPONSE FACTOR 1.000 ALTITUDE OF GZ 179.000 METERS ABOVE MSL

UNDISTORTED MAPS ARE PRODUCED BY THE GRID INCREMENTS PRINTED ABOVE

REQUEST NUMBER 1

MAP TYPE 2 T1 = 0.00 T2 = 3.00 MASCHN = 0

QCUT= .1000E-03 CUTMAP= .10000E-01

TABLE OF TOTAL ACTIVITY IN EACH PARTICLE SIZE CLASS

PSIZE	FP	PSIZE	FP	PSIZE	FP	PSIZE	FP
2.4831E-13	6.1087E+09	2.8751E-04	7.5157E+09	1.1913E-04	9.0129E+09	3.7667E-05	1.2379E+10
1.3111E-13	6.3763E+09	2.5163E-04	7.5715E+09	9.7331E-05	9.2673E+09	3.0753E-05	1.3280E+10
6.9391E-04	6.5822E+09	2.2154E-04	7.3327E+09	3.6085E-05	9.5497E+09	2.4732E-05	1.4506E+10
6.8190E-04	6.7546E+09	1.9591E-04	8.0010E+09	7.6126E-05	9.8644E+09	1.8866E-05	1.6345E+10
5.4839E-04	6.9130E+09	1.7381E-04	8.1779E+09	6.7022E-05	1.0220E+10	1.2863E-05	1.9716E+10
4.5499E-04	7.0648E+09	1.5454E-04	8.3653E+09	5.8659E-05	1.0629E+10	6.7923E-06	2.8264E+10
3.8534E-04	7.2142E+09	1.3760E-04	8.5651E+09	5.1936E-05	1.1106E+10	0.	0.
3.3111E-04	7.3638E+09	1.2257E-04	8.7709E+09	4.3767E-05	1.1677E+10	0.	0.

K FACTORS COMPUTED FROM THE FP TABLE - 6.1120E+09 (R-M**2)/(HR-KT) 2.3560E+03 (R-MI**2)/(HR-KT)

THIS MAP USES THE TWO-LINE E FORMAT

THE QUANTITY PRESENTED IS
EXPOSURE RATE NORMALIZED TO TIME H+1 HOUR.
UNITS ARE ROENTGENS PER HOUR
GROUND ZERO IS LOCATED AT X = 0.0 , Y = 0.0

STRIP 1   DELFIC TEST PROBLEM - DPM   MAP TYPE 2

```
 ***     -7200.     -3600.       0.      3600.      7200.     10800.     14400.     18000.     21600.     25200. **

          1     1     1     1     1     1     2     1     1     0     0    -1     0
 51000.  1.320 4.154 4.015 5.722 7.017 9.181 1.303 7.581 3.325 7.425  .770  .346 0.000

          1     1     1     1     1     1     2     1     1     0     0    -1     0
 49500.  1.148 2.395 5.514 6.141 7.272 9.714 1.048 7.682 3.214 6.607  .607  .235 0.000

          0     1     1     1     1     2     2     1     1     0     0    -1     0
 48000.  4.587 3.067 8.053 6.653 7.709 1.074 1.095 7.783 3.619 5.524  .439  .142 0.000

          0     1     1     1     1     2     2     1     1     0     0     0     0
 46500.  3.115 4.410 7.763 5.900 8.322 1.095 1.147 7.646 2.685 4.330  .299 0.000 0.000

          0     1     1     1     1     2     2     1     1     0     0     0     0
 45000.  2.769 5.465 5.220 6.504 8.657 1.149 1.167 7.314 2.339 3.397  .209 0.000 0.000

          0     1     1     1     1     2     2     1     1     0     0     0     0
 43500.  2.454 5.625 4.991 7.585 9.177 1.207 1.193 7.044 2.098 2.756  .152 0.000 0.000

          0     1     1     1     1     2     2     1     1     0     0     0     0
 42000.  3.495 3.142 8.110 9.164 9.536 1.264 1.220 6.917 1.913 2.278  .108 0.000 0.000

          0     1     2     1     2     2     2     1     1     0    -1     0     0
 40500.  3.328 2.292 1.177 7.906 1.017 1.329 1.253 6.729 1.684 1.757  .715 0.000 0.000

          0     1     1     1     2     2     2     1     1     0    -1     0     0
 39000.  1.411 2.748 9.732 8.401 1.053 1.392 1.253 6.336 1.421 1.305  .460 0.000 0.000

          0     1     1     2     2     2     2     1     1     0    -1     0     0
 37500.   .629 3.930 6.424 1.015 1.128 1.454 1.232 5.887 1.201  .988  .305 0.000 0.000

          0     1     1     2     2     2     2     1     1     0    -1     0     0
 36000.   .409 4.695 9.043 1.123 1.190 1.518 1.234 5.531 1.232  .755  .202 0.000 0.000

          0     1     2     2     2     2     2     1     0     0    -1     0     0
 34500.   .447 1.075 1.453 1.091 1.295 1.575 1.283 5.175 8.600  .555  .124 0.000 0.000

          0     1     2     2     2     2     2     1     0     0     0     0     0
 33000.   .420 1.160 1.193 1.232 1.387 1.636 1.275 4.714 7.055  .395 0.000 0.000 0.000

          0     1     1     2     2     2     2     1     0     0     0     0     0
 31500.   .187 1.572 7.644 1.535 1.464 1.585 1.245 4.229 5.702  .283 0.000 0.000 0.000

         -1     1     2     2     2     2     2     1     0     0     0     0     0
 30000.   .912 4.617 1.137 1.577 1.590 1.730 1.212 3.792 4.587  .139 0.000 0.000 0.000

         -1     1     2     2     2     2     2     1           0     0     0     0
 28500.   .719 2.351 1.610 1.633 1.722 1.761 1.179 3.375 3.568  .174 0.000 0.000 0.000

          0     0     1     2     2     2     2     1     0    -1     0     0     0
 27000.   .111 4.776 9.557 2.039 1.037 1.625 1.103 2.637 2.654  .853 0.000 0.000 0.000

         -1     1     1     2     2     2     2     1     0    -1     0     0     0
 25500.   .548 1.272 6.754 2.098 2.013 1.846 1.025 2.337 1.847  .507 0.000 0.000 0.000

         -1     1     2     2     2     2     1     1     0    -1     0     0     0
 24000.   .157 5.435 1.553 2.125 2.177 1.857 3.243 1.834 1.245  .273 0.000 0.000 0.000
```

```
          -1     1     2     2     2     2     1     1     0    -1     0     0     0
22500.    .132 1.326 1.763 2.533 2.737 1.049 3.023 1.338  .775  .123 0.000 0.000 0.000

          -1     0     1     2     2     2     1     0     0     0     0     0     0
21600.    .376 3.355 9.043 2.555 2.530 1.885 6.595 8.866  .786 0.000 0.000 0.000 0.000

          -1     1     2     2     2     2     1     1     0     0     0     0     0
19500.    .122 5.777 1.673 2.790 2.669 1.710 5.024 5.177  .166 0.000 0.000 0.000 0.000

           0     1     2     2     2     2     1     0    -1     0     0     0     0
18000.   0.000 4.176 1.664 3.121 2.794 1.538 3.434 2.533  .586 0.000 0.000 0.000 0.000

          -1     0     2     2     2     2     1     0    -1     0     0     0     0
16500.    .451 4.067 1.717 3.153 2.831 1.251 2.021  .986  .152 0.000 0.000 0.000 0.000

          -1     1     2     2     2     1     0     0     0     0     0     0     0
15000.    .636 6.755 2.143 3.742 2.779 9.533 3.344  .296 0.000 0.000 0.000 0.000 0.000

           0     0     2     2     2     1     0    -1     0     0     0     0     0
13500.   0.000 6.046 1.594 3.987 2.633 6.129 3.793  .667 0.000 0.000 0.000 0.000 0.000

           0     0     2     2     2     1     0    -1     0     0     0     0     0
12000.   0.000 4.497 3.915 5.964 2.422 3.481 1.155  .107 0.000 0.000 0.000 0.000 0.000

           0     0     2     2     2     1     0     0     0     0     0     0     0
10500.   0.000  .829 4.564 5.440 2.113 1.818  .283 0.000 0.000 0.000 0.000 0.000 0.000

           0     0     2     2     2     0    -1     0     0     0     0     0     0
 9000.   0.000  .280 1.463 6.147 1.652 5.136  .554 0.000 0.000 0.000 0.000 0.000 0.000

           0    -1     1     3     2     0     0     0     0     0     0     0     0
 7500.   0.000  .953 3.307 1.011 2.043 4.667 0.000 0.000 0.000 0.000 0.000 0.000 0.000

           0    -1     0     3     2     0     0     0     0     0     0     0     0
 6000.   0.000  .244 7.824 1.312 2.729 6.967 0.000 0.000 0.000 0.000 0.000 0.000 0.000

           0     0     0     2     2     1    -1     0     0     0     0     0     0
 4500.   0.000 0.000  .257 6.969 4.120 1.740  .613 0.000 0.000 0.000 0.000 0.000 0.000

           0     0    -1     2     2     1     0     0     0     0     0     0     0
 3000.   0.000 0.000  .153 6.549 5.489 2.540  .215 0.000 0.000 0.000 0.000 0.000 0.000

           0     0     0     1     1     1     0     0     0     0     0     0     0
 1500.   0.000 0.000 0.000 2.736 8.168 1.823  .354 0.000 0.000 0.000 0.000 0.000 0.000

           0     0     0     1     1     0     0     0     0     0     0     0     0
    0.   0.000 0.000 0.000 0.000 1.624 5.576  .275 0.000 0.000 0.000 0.000 0.000 0.000

           0     0     0     0    -1     0    -1     0     0     0     0     0     0
-1500.   0.000 0.000 0.000 0.000  .150  .541  .956 0.000 0.000 0.000 0.000 0.000 0.000

***      -7200.     -3600.        0.     3600.     7200.    10800.    14400.    18000.    21600.    25200. **

              SUM OF MAP ORDINATES =    .2855382E+05
OUTPUT PROCESSING IS COMPLETED.
```

5. FORTRAN CODE LISTINGS

```
*DECK,TRPL
      SUBROUTINE TRPL (
     1  ARG, NPR, PARA, PARB, VRB)
C
C *********************************************************************
C
C     TRPL USES LINEAR INTERPOLATION TO LOCATE POSITION OF ARG WITHIN
C     THE ONE-DIMENSIONAL ARRAY PARA AND COMPUTES FOR THE CORRESPONDING
C     POSITION IN THE ONE-DIMENSIONAL ARRAY PARB, VRB. NPR IS THE
C     DIMENSION OF PARA AND PARB (WHOSE ELEMENTS CORRESPOND ONE TO ONE).
C     IF ARG IS OUTSIDE THE TABULATED VALUES OF PARA, VRB IS SELECTED
C     FROM THE CORRESPONDING END OF PARB.
C     PARA IS ORDERED FROM LEAST (PARA (1)) TO GREATEST (PARA (NPR))
C
C *********************************************************************
C
      DIMENSION
     1  PARA ( NPR), PARB (NPR)
C
C *********************************************************************
C *********************************************************************
C
  020 IF (ARG - PARA (1)) 022, 022, 040
  022 MB = 1
  024 VRB = PARB (MB)
  026 RETURN
  040 DO 054 MA =2, NPR
      IF (ARG - PARA (MA)) 048, 044, 054
  044 MB = MA
      GO TO 024
  048 VRB = (ARG - PARA (MA - 1)) * (PARB (MA) - PARB (MA - 1)) /
     1  (PARA (MA) - PARA (MA - 1)) + PARB (MA - 1)
      GO TO 026
  054 CONTINUE
      MB = NPR
      GO TO 024
      END
```

```
*DECK,ERROR
      SUBROUTINE ERROR (PROGRM,IRROR,ISOUT)
C     T. W. SCHWENKE
C     1 MARCH 1966
C
C *********************************************************************
C
C     THIS PROGRAM WRITES A GENERALIZED ERROR COMMENT OF THE FOLLOWING
C     FORM ON TAPE ISOUT AND THEN RETURNS IF THE SIGN OF IRROR IS
C     POSITIVE OR STOPS IF ITS SIGN IS NEGATIVE.
C
C         ERROR SENSED IN PROGRAM (PROGRM) AT OR NEAR STATEMENT NUMBER
C         (IRROR).  PLEASE REFER TO THE PROGRAM LISTING.
C
C     PRIOR TO CALLING ERROR  THE PARAMETER  PROGRM  MUST BE SET
C                                   WITH THE BCD NAME OF THE CALLING
C     PROGRAM AND PARAMETER  IRROR  MUST BE SET WITH THE NUMBER OF THE
C     FORTRAN STATEMENT WHICH BEST IDENTIFIES THE ERROR CONDITION.
C
C *********************************************************************
C
 1    FORMAT(//26H ERROR SENSED IN PROGRAM  A6,30H  AT OR NEAR STATEMENT
     1 NUMBER I6,40H .  PLEASE REFER TO THE PROGRAM LISTING.)
C
C *********************************************************************
C **************************************************************Q********
C
      IRR= IABS(IRROR)
      WRITE(ISOUT,1)PROGRM,IRR
      IF(IRROR)101,100,100
  100 RETURN
  101 STOP
      END
```

```
*DECK,SETTLE
      SUBROUTINE SETTLE(D,RHOP,RHO,ETA,T,P,V,I)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C     COMPUTES STILL-AIR SETTLING SPEED OF RIGID SPHERES ACCORDING TO
C     THE EQUATIONS OF BEARD (JAS33,852(1976)) FOR SMALL SPHERES
C     (CORR .LE. 84.175), AND DAVIES(PROC.PHYS.SOC.(LONDON)57,256(1945))
C     FOR LARGER SPHERES.
C
C     GLOSSARY (SI UNITS)
C     C         4.0*G/3.0    WHERE G IS ACCELERATION OF GRAVITY (9.8)
C     CORR      DAVIES NUMBER
C     D         SPHERE DIAMETER
C     ETA       VISCOSITY
C     P         PRESSURE
C     RHO       FLUID DENSITY
C     RHOP      SPHERE DENSITY
C     T         TEMPERATURE
C     V         SETTLING SPEED
C     I         ACCURACY INDICATOR
C               I = 0 RESULT IS ACCURATE
C               I = 1 RESULT IS INACCURATE, DAVIES NUMBER IS TOO LARGE
C
      DATA C/13.066667/
C
      I = 0
COMPUTE DAVIES NUMBER
      CORR = C*(RHOP-RHO)*RHO*D**3/ETA**2
CHECK DAVIES NUMBER VALUE FOR ROUTING
      IF(CORR.GT. 0.3261) IF(CORR-84.175) 100,100,200
COMPUTE VIA STOKES-LAW EQUATION
      V = CORR*ETA/(24.0*RHO*D)
      GO TO 500
COMPUTE VIA BEARDS EQUATION
  100 Y = ALOG(CORR)
      V = ETA/(RHO*D)*EXP(-3.18657 + Y*(0.992696 + Y*(-0.153193E-2
     1+Y*(-0.987059E-3 + Y*(-0.578878E-3 + Y*(0.855176E-4
     2-Y*0.327815E-5))))))
      GO TO 500
COMPUTE VIA DAVIES EQUATIONS
  200 IF(CORR.GT.140.)IF(CORR-4.5E7)400,400,300
      V = ETA/(RHO*D)*CORR*(4.16666667E-2 + CORR*(-2.3363E-4
     1+CORR*(2.0154E-6-CORR*6.9105E-9)))
      GO TO 500
  300 I = 1
  400 Y = ALOG10(CORR)
      V = ETA/(RHO*D)*(10.0)**(-1.29536 + Y*(0.986 + Y*(-0.046677+
     1Y*1.1235E-3)))
      RETURN
CORRECT SETTLING SPEED FOR SLIP
  500 V = V*(1.0 + 54.088*ETA*SQRT(T)/P/D)
      RETURN
      END
```

```
*DECK,ICRMEX
      SUBROUTINE ICRMEX(NUMTAP)
C
C     H. G. NORMENT. ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C *********************************************************************
C
C                     INITIALIZATION AND CLOUD RISE MODULE
C
C     DETERMINES INITIAL VALUES OF -
C     TIME, TEMPERATURE, TOTAL SOIL MASS, FRACTION OF THE SOIL BURDEN IN
C     THE VAPOR PHASE, AND THE SIZE FREQUENCY DISTRIBUTION OF THE
C     FALLOUT PARTICLES.  NEXT IT PERFORMS A DYNAMIC CLOUD RISE AND
C     STABILIZATION SIMULATION.  THEN IT ESTABLISHES AN
C     AXISYMMETRIC DISTRIBUTION OF FALLOUT PARCELS ABOVE GZ.   FINALLY
C     THE COORDINATES OF THESE PARCELS ARE ADJUSTED TO ACCOUNT FOR
C     WIND TRANSPORT DURING THE PERIOD OF CLOUD RISE AND STABILIZATION
C     AND A TRANSLATION OF THE COORDINATES OF GZ AND  DETONATION TIME.
C
C *************************  GLOSSARY  ********************************
C
C  ALT    - ARRAY(256), ATMOSPHERE ALTITUDE IN METERS(MSL) CORRESPONDING
C           TO ATP, PRS, RLH, RHO, ETA
C  ATMR   - SUBROUTINE, READS IN TABLES OF ALT,ATP,PRS,RLH,RHO,ETA
C  ATID   - ARRAY(12), 72 ALPHANUMERIC CHARACTERS FOR ATMOSPHERE IDENT.
C  ATP    - ARRAY(256), ATMOSPHERE TEMPERATURE (K) MATCHES ALT
C  BARMU  - MEDIAN DIAMETER OF THE LOGNORMAL PARTICLE SIZE VS. VOLUME
C           DISTRIBUTION (MICROMETERS)
C  BZ     - DEPOSIT INCREMENT LINEAR DIMENSION(CX(5,MCX)/IRAD)
C  CAYM   -  K-TO-MASS RATIO PARAMETER OF THE POWER-LAW PARTICLE DISTBN.
C  CG     - ARRAY(200), FALLING SPEEDS OF PARTICLES IN THE CLOUD (M/SEC)
C  CHANGE - CLOUD TIME AFTER WHICH STEP LENGTH CHANGES TO DST2
C  CL     - LATENT HEAT OF VAPORIZATION OF WATER
C  CMLR   - CLOUD MASS LOSS RATE OF PARTICULATE FALLOUT
C  CP     - SPECIFIC HEAT OF AIR
C  CPAI   - SPECIFIC HEAT OF AIR INTEGRATED FROM TE TO T
C  CPFR   - SUBROUTINE, COMPUTES PARTICLE FALLOUT RATE DURING CLOUD
C           RISE CALCULATIONS
C  CR     - WEIGHTED AVERAGE SPECIFIC HEAT FOR AIR AND SOIL
C  CRM    - SUBROUTINE, COMPUTES DYNAMIC CLOUD RISE AND EXPANSION
C  CRMINT - SUBROUTINE, COMPUTES INITIAL CRM VARIABLES
C  CRMW   - SUBROUTINE, PRINTS CRM OUTPUT
C  CX     - ARRAY(50,10), CLOUD PROPERTIES VS. TIME COMPILED DURING CRM
C           CALCULATIONS AND USED BY RSXP AND WNDSFT
C           (J,1) - TIME(SEC) AFTER BURST
C           (J,2) - CLOUD TIME INTERVAL(SEC) BEGINNING AT CX(J,1)
C           (J,3) - CLOUD BASE(M) AT CX(J,1)
C           (J,4) - CLOUD TOP(M) AT CX(J,1)
C           (J,5) - CLOUD RADIUS(M) AT CX(J,1)
C           (J,6) - CLOUD BASE RATE (M/SEC) DURING CX(J,2)
C           (J,7) - CLOUD TOP  RATE (M/SEC) DURING CX(J,2)
C           (J,8) - CLOUD RADIAL RATE(M/SEC) DURING CX(J,2)
C           (J,9) - CLOUD TEMPERATURE (K) AT CX(J,1)
C           (J,10) - IN-CLOUD GAS DENSITY (KG/M**3) AT CX(J,1)
C  CXPN   - SUBROUTINE, TABULATES CX ARRAY
C  C2     - CONSTANT USED IN EDDY VISCOSITY MOMENTUM GENERATION
C           (YIELD DEPENDENT)
C  C3     - CONSTANT USED IN COMPUTING TURBULENT ENERGY DISSIPATION RATE
C  C6     - CONSTANT USED IN COMPUTING AIR ENTRAINMENT RATE INTO CLOUD
C           CAUSED BY WIND SHEAR
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C  DEK    - DERIVATIVE OF EK
C  DMEAN  - MEDIAN DIAMETER (MICROMETERS) OF A LOGNORMAL PARTICLE
C           SISE DISTRIBUTION
C  DERIV  - SUBROUTINE, EVALUATES DERIVATIVES OF CLOUD PROPERTIES
C  DETID  - ARRAY(12), 72 ALPHANUMERIC DETONATION IDENTIFICATION
C  DIAM   - ARRAY(201), UPPER BOUNDARY OF I-TH PARTICLE SIZE CLASS.
C           THE LAST ENTRY IN THE ARRAY IS THE LOWER BOUNDARY OF THE
C           LAST(SMALLEST) PARTICLE SIZE CLASS. THE LENGTH OF THE DIAM
C           ARRAY IS ALWAYS ONE GREATER THAN THE NUMBER OF SIZE CLASSES.
C           (METERS)
C  DNS    - FALLOUT PARTICLE DENSITY (GM/CM**3), DEFAULT VALUE IS 2.6
C  DPST   - ARRAY(8,2),    FALLOUT PARCEL  VARIABLES COMPILED IN
C           SUBROUTINE RSXP. THE SECOND INDEX IS NEEDED ONLY IN THE RSXP
C           CALCULATIONS TO DISTINGUISH THE PARCEL TOP FROM BASE
C           (1,MBT) - TIME  (SEC) OF ALTITUDE STABILIZATION OR GROUNDING
C           (2,MBT) - ALTITUDE OF  PARCEL   CENTER OF MASS (METERS)
C           (3,MBT) - PARCEL    RADIUS AT CENTER OF MASS (METERS)
C           (4,MBT) - MEAN PARTICLE DIAMETER  (METERS)
C           (5,MBT) - PARCEL MASS (KG) FOR A SIZE-MASS FRACTION PARTICLE
C                     DISTRIBUTION
C                     PARCEL ACTIVITY FRACTION FOR A SIZE-ACTIVITY
C                     FRACTION PARTICLE DISTRIBUTION
C           (6,MBT) - PARCEL    VERTICAL THICKNESS (METERS)
C           (7,MBT) - ALTITUDE OF PARCEL BASE (METERS)
C           (8,MBT) - PARCEL    VOLUME  (CUBIC METERS)
C  DPSTK  - NUMBER OF  FALLOUT PARCELS  PER PARTICLE SIZE CLASS
C  DPX    - ARRAY(2,90),  FALLOUT PARCEL   RISE AND EXPANSION VARIABLE
C           (1,J) - LIFT RATE FACTOR ABOVE CLOUD BASE (1/SEC)
C           (2,J) - LIFT RATE FACTOR BELOW CLOUD BASE (1/SEC)
C  DRM    - DERIVATIVE OF RM
C  DS     - DERIVATIVE OF S
C  DST    - INTEGRATION TIME STEP
C  DST0   - INITIAL INTEGRATION TIME STEP
C  DST1   - INTERMEDIATE INTEGRATION TIME STEP
C  DST2   - FINAL VALUE OF INTEGRATION TIME STEP
C  DT     - DERIVATIVE OF T
C  DU     - DERIVATIVE OF U
C  DV3L   - ARRAY(8), USED TO TRANSMIT VARIABLE DERIVATIVES TO RKGILL
C  DWT    - DERIVATIVE OF WT
C  DX     - DERIVATIVE OF X
C  DZ     - DERIVATIVE OF Z
C  ED     - EDDY VISCOSITY LOSS RATE OF KINETIC ENERGY OF RISE
C  EK     - TURBULENT KINETIC ENERGY DENSITY
C  EPS    - KINETIC ENERGY LOSS RATE
C  ERROR  - SUBROUTINE, FOR GENERAL UTILITY ERROR INDICATION
C  ES     - SATURATION PRESSURE OF WATER VAPOR (INVALID FOR TEMPERATURE
C           ABOVE BOILING POINT OF WATER)
C  ETA    - ARRAY(256), ATMOSPHERIC DYNAMIC VISCOSITY  (COEFF. OF VISC.)
C           (KGM/(M-SEC)) MATCHES ALT ARRAY
C  EXTM   - IN SUBROUTINE RSXP, TIME INCREMENT BETWEEN WAFER HISTORY
C           DESCRIPTION POINTS
C  F      - FRACTION OF W IN FIREBALL AT START OF RISE
C  FMASS  - ARRAY(200),PARTICLE SIZE CLASS FRACTION OF TOTAL MASS OR
C           ACTIVITY LIFTED BY THE CLOUD
C  FMT    - OBJECT TIME FORMAT USED TO READ DATA
C  FORM   - DESIGNATES WHETHER WIND VELOCITIES ARE RESOLVED OR IN POLAR
C           (METEOROLOGICAL CONVENTION) FORM
C  FW     - FISSION YIELD IN KILOTONS
C  GOPST  - ARRAY(10,100),   FALLOUT PARCEL  VARIABLES (OUTPUT OF RSXP)
C           (1,J) - FALLOUT PARCEL    X COORDINATE (METERS)
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C             (2,J) - FALLOUT PARCEL    Y COORDINATE (METERS)           ICRME121
C             (3,J) - TIME COORDINATE (SEC)                             ICRME122
C             (4,J) - PARTICLE DIAMETER (METERS)                        ICRME123
C             (5,J) - PARCEL MASS (KG) FOR A SIZE-MASS FRACTION PARTICLE ICRME124
C                     DISTRIBUTION                                      ICRME125
C                     PARCEL ACTIVITY FRACTION FOR A SIZE-ACTIVITY      ICRME126
C                     FRACTION PARTICLE DISTRIBUTION                    ICRME127
C             (6,J) - Z COORDINATE OF  PARCEL   CENTER OF MASS (METERS) ICRME128
C             (7,J) - PARCEL    RADIUS AT CENTER OF MASS (METERS)       ICRME129
C             (8,J) - PARCEL    VERTICAL THICKNESS (METERS)             ICRME130
C             (9,J) - ALTITUDE OF PARCEL BASE (METERS)                  ICRME131
C            (10,J) - PARCEL    VOLUME (CUBIC METERS)                   ICRME132
C  HEIGHT - HEIGHT OF BURST (METERS) ABOVE GROUND ZERO                  ICRME133
C           (FOR A SUBSURFACE BURST INPUT A NEGATIVE VALUE)             ICRME134
C  HLR    - RELATIVE HUMIDITY AT ALTITUDE OF CLOUD CENTER               ICRME135
C  HOB    - HEIGHT(FT) OF BURST ABOVE GROUND ZERO                       ICRME136
C  IRAD   - NUMBER OF CLOUD DISC  RADIUS SUBDIVISIONS (SEE BZ)          ICRME137
C  IRISE  - LOGICAL DESIGNATION FOR TAPE USED FOR TEMPORY STORAGE IN    ICRME138
C           ATMR AND FOR RSXP OUTPUT                                    ICRME139
C  ISIN   - INPUT TAPE                                                  ICRME140
C  ISOUT  - OUTPUT TAPE                                                 ICRME141
C  JBASE  - COMPUTED GO TO INDEX USED IN SUBROUTINE RSXP                ICRME142
C           1 - CONTINUE DPST TRAJECTORY COMPUTATION                    ICRME143
C           2 - DPST TRAJECTORY COMPUTATION COMPLETE                    ICRME144
C  JPARN  - BINARY OUTPUT TAPE, SUBROUTINE WNDSFT                       ICRME145
C  KBASE  - COMPUTED GO TO INDEX USED IN SUBROUTINE RSXP                ICRME146
C           1 - ADJUST DPST RADIUS AND ACTIVITY FOR LEAVING CLOUD       ICRME147
C           2 - ADJUSTMENT OF 1 HAS BEEN MADE                           ICRME148
C  KCX    - NUMBER OF DPST RISE AND EXPANSION INTERVALS                 ICRME149
C  KDI    - NUMBER OF VERTICAL CLOUD SUBDIVISIONS PER PARTICLE SIZE CLASICRME150
C           IF NOT PUNCHED, IT IS COMPUTED IN ICM                       ICRME151
C  KDIP   - IN SUBROUTINE RSXP, NUMBER OF VERTICAL SUBDIVISIONS OF A    ICRME152
C           PARCEL WHOSE TOP AND BASE RADII ARE NOT EQUAL               ICRME153
C  KDPST  - SEE DPSTK                                                   ICRME154
C  KSV    - INDEX WHICH DETERMINES FUNCTION OF SUBROUTINE RSTR          ICRME155
C           1 - PRESERVE VARIABLES AT START OF TIME STEP                ICRME156
C           2 - RESTORE VARIABLES TO THOSE AT START OF TIME STEP        ICRME157
C  LODD   - LENGTH OF PARCEL   DESCRIPTION DATA BLOCK (GDPST ARRAY IN   ICRME158
C           RSXP)                                                       ICRME159
C  MBT    - IN SUBROUTINE RSXP, DISTINGUISHES A PARCEL TOP FROM BASE    ICRME160
C           MBT=1 SPECIFIES A PARCEL TOP                                ICRME161
C           MBT=2 SPECIFIES A PARCEL BASE                               ICRME162
C  MCX    - NUMBER OF TIME POINTS (COLUMNS) OF CX ARRAY                 ICRME163
C  MWYA   - 1, INITIAL ENTRY INTO CXPN                                  ICRME164
C           2, REGULAR ENTRY                                            ICRME165
C           3, FINAL ENTRY                                              ICRME166
C  N      - CLOUD MODE SWITCH                                           ICRME167
C  NAT    - NUMBER OF ELEMENTS IN ALT AND CORRESPONDING ARRAYS          ICRME168
C           LIMITS OF NAT = 1,256                                       ICRME169
C  NDSTR  - NUMBER OF ENTRIES IN PARTICLE SIZE CLASS TABLE              ICRME170
C  NHODO  - NUMBER OF ENTRIES IN THE WIND PROFILE TABLE                 ICRME171
C  P      - ATMOSPHERIC PRESSURE AT CLOUD CENTER ALTITUDE (PASCALS)     ICRME172
C  PHI    - FRACTION OF F*W USED TO HEAT AIR AND SOIL AT THE INITIAL    ICRME173
C           TIME.  THE REMAINDER IS USED TO HEAT WATER                  ICRME174
C  PPST   - ARRAY(8,10), TEMPORARY STORAGE OF PARCEL VARIABLES IN RSXP  ICRME175
C  PRS    - ARRAY(256) ATMOSPHERIC PRESSURE (PASCALS) MATCHES ALT       ICRME176
C  PS     - ARRAY(200), PARTICLE SIZE CLASS MIDPOINT DIAMETER (METERS)  ICRME177
C  PW     - PARTIAL PRESSURE OF WATER VAPOR IN THE CLOUD                ICRME178
C  Q      - CONVERSION FACTOR FOR FRACTION MASS TO NUMBER OF PARTICLES  ICRME179
C                     PER M**3                                          ICRME180
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C  QX      - FACTOR CONVERTS CLOUD TEMPERATURE TO VIRTUAL CLOUD
C            TEMPERATURE
C  QXE     - INVERSE OF FACTOR TO CONVERT AMBIENT TEMPERATURE TO
C            VIRTUAL AMBIENT TEMPERATURE
C  R       - CLOUD HORIZONTAL RADIUS
C  RA      - GAS DENSITY OF CLOUD
C  RADC    - PI/180,  CONVERTS DEGREES TO RADIANS
C  RADIUS  - FALLOUT  PARCEL  RADIUS USED IN SUBROUTINE RSXP
C  RHO     - ARRAY(256)  ATMOSPHERE AIR DENSITY (KGM/M**3) MATCHES ALT.
C  RHOP    - FALLOUT PARTICLE DENSITY (KG/M**3)
C  RKGILL  - SUBROUTINE, RUNGE-KUTTA-GILL INTEGRATION
C  RL      - ENTRAINMENT PARAMETER
C  RLH     - ARRAY(256)  ATMOSPHERE RELATIVE HUMIDITY MATCHES ALT(PERCENT
C  RM      - CLOUD MASS
C  RMA0    - INITIAL AIR MASS IN CLOUD
C  RMW0    - INITIAL WATER MASS IN CLOUD
C  RSTR    - SUBROUTINE WHICH PRESERVES AND/OR RESTORES CRM VARIABLES
C  RSXP    - SUBROUTINE, ESTABLISHES FALLOUT PARCEL POSITIONS IN SPACE
C            ABOVE GZ AT STABILIZATION TIME.
C  RZT     - VERTICAL CLOUD RADIUS
C  S       - CONDENSED SOIL MIXING RATIO
C  SD      - GEOMETRIC STANDARD DEVIATION FOR A LOGNORMAL PARTICLE SIZE
C            DISTRIBUTION (SET EQUAL TO 4.0 IF NOT INPUT) (DIMENSIONLESS)
C            FOR A SIZE-ACTIVITY PARTICLE DISTBN. THE CODE SETS SD=-1.0
C  EXPO    - EXPONENTIAL PARAMETER OF THE POWER-LAW PARTICLE DISTBN.
C  SHAPE   - EQUAL TO RZT/R.  A CONSTANT USED TO COMPUTE CLOUD SHAPE
C            WHEN U .GT. 0.0
C  SHWIND  - SUBROUTINE, READS SHOT-TIME WIND DATA
C  SLDTMP  - PARTICLE SOLIDIFICATION TEMPERATURE (K) DEFAULT VALUE 2200.
C  SMALLT  - TIME AFTER START OF COMPUTATION
C  SOILHT  - LATENT HEAT OF VAPORIZATION OF CLOUD SOIL CONSTITUENT
C  SSAM    - TOTAL MASS (KG) OF SOIL (OR WEAPON DEBRIS FOR AN AIRBURST)
C            IN THE CLOUD AT THE INITIAL TIME
C  T       - CLOUD TEMPERATURE (K)
C  TE      - ATMOSPHERIC TEMPERATURE AT CLOUD CENTER ALTITUDE (K)
C  TGZ     - TIME (SEC) OF DETONATION
C  TME       TIME (SEC) OF INITIAL CONDITIONS SPECIFICATION RELATIVE TO
C            DETONATION.
C  TMPG    - INITIAL VAPOR TEMPERATURE (K)
C  TMPS    - INITIAL TEMPERATURE OF CONDENSED PHASE MATERIAL IN CLOUD (K)
C  TMSD    - TIME OF PARTICLE SOLIDIFICATION (SEC) WITHIN CLOUD
C  TRPL    - SUBROUTINE, LINEAR INTERPOLATION
C  TSRD    - R-RATE CLOUD RISE TERMINATION SWITCH PARAMETER
C  TSTM    - TIME AT WHICH NEXT CX ARRAY ENTRIES ARE TO BE MADE
C  T2M     - TIME (SEC) OF THE FIREBALL SECOND TEMPERATURE MAXIMUM
C  U       - CLOUD VERTICAL VELOCITY
C  V       - CLOUD VOLUME
C  VBL     - ARRAY(8), DUMMY VARIABLES OF INTEGRATION(SUBS. DERIV,RKGILL)
C  VIS     - DYNAMIC VISCOSITY (KG/(M-SEC))
C  VPR     - MASS OF FALLOUT VAPOR (KG) AT THE INITIAL TIME
C  VX(I)   - ARRAY(100), X-COMPONENT OF WIND VELOCITY AT WIND PROFILE
C            STRATUM I, (METERS/SEC)
C  VY(I)   - ARRAY(100), Y-COMPONENT OF WIND VELOCITY AT WIND PROFILE
C            STRATUM I, (METERS/SEC)
C  W       - TOTAL YIELD (KT)
C  WNDSFT  - SUBROUTINE, ADJUSTS FALLOUT PARCEL COORDINATES FOR WIND
C            TRANSPORT DURING RISE AND EXPANSION AND FOR COORDINATE
C            TRANSLATION.
C  WT      - SOLID AND LIQUID WATER MIXING RATIO
C  X       - IN-CLOUD WATER VAPOR MIXING RATIO
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```
C   XE      - AMBIENT AIR WATER VAPOR MIXING RATIO
C   XGZ     - X COORDINATE OF GRCUND ZERO (METERS)
C   Y       - ARRAY(200),NUMBER OF IN-CLOUD PARTICLES/UNIT VOLUME OF CLOUD
C   YGZ     - Y COORDINATE OF GRCUND ZERO (METERS)
C   Z       - CLOUD CENTER ALTITUDE (METERS)
C   ZBFR    - MAXIMUM Z OF CURRENT OR PREVIOUS ENTRIES TABULATED BY CXPN
C   ZBRSTZ  - Z-COORDINATE OF BURST GROUND ZERO (METERS ABOVE MSL)
C   ZLMT    - UPPER LIMIT FOR CLOUD CENTER ALTITUDE TO PREVENT POSSIBLE
C             COMPUTATIONAL RUNAWAY
C   ZSCL    - SCALED HEIGHT OF BURST (FT/(KT)**(1.0/3.4))
C   ZV(I)   - ALTITUDE OF CENTER PLANE OF WIND PROFILE STRATUM I (M MSL)
C   ZVSB    - IN SUBROUTINE RSXP, DISTANCE OF A PARCEL ABOVE CLOUD BASE
C
C ********************************************************************
C
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)
C
      DIMENSION CXTIM(50),CXTMP(50),NUMTAP(15)
      EQUIVALENCE (CXTIM(1),GDPST(601)), (CXTMP(1),GDPST(651))
C
C ********************************************************************
C
COPY IN BASIC AND CONTROL DATA, ESTABLISH CONDITIONS IN THE FIREBALL AT
C     INITIALIZATION TIME, SET UP FALLOUT PARTICLE SIZE DISTRIBUTION
C     TABLES AND PRINT HEADINGS AND DATA.
      ISIN =NUMTAP( 1)
      ISOUT=NUMTAP( 2)
      CALL ICM
      IF(IC(3) .NE. 0) RETURN
      IRISE=NUMTAP( 3)
      JPARN=NUMTAP( 4)
COPY IN ATMOSPHERE DATA
      CALL ATMR
COPY IN SHOT-TIME WIND DATA
      CALL SHWIND
COMPUTE INITIAL VALUES FOR THE CLOUD RISE EQUATIONS
      CALL CRMINT
COMPUTE THE DYNAMIC CLOUD RISE
      CALL CRM
COMPUTE TIME OF FALLOUT SOLIDIFICATION
      DO 122 MA=1,MCX
      MB=MCX-MA+1
      CXTIM(MA)=CX(MB,1)
  122 CXTMP(MA)=CX(MB,9)
      CALL TRPL(SLDTMP,MCX,CXTMP,CXTIM,TMSD)
      WRITE(ISOUT,513)SLDTMP,TMSD
  513 FORMAT( /////10X,42HTIME OF SOIL SOLIDIFICATION AT TEMPERATUREF10.
     14,  8H DEG. ISF9.4, 5H SEC.)
COMPUTE FALLOUT PARCEL DISTRIBUTION IN SPACE ABOVE GZ AT STABLIZATION
      CALL RSXP
COMPUTE WIND-ADJUSTED FALLOUT PARCEL COORDINATES AND TRANSLATE GZ AND
C     DETONATION TIME COORDINATES.  WRITE BINARY OUTPUT TAPE.
      CALL WNDSFT
      RETURN
      END
```

```
*DECK,ICM
      SUBROUTINE ICM
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     PROGRAM TO DETERMINE THE INITIAL CONDITIONS SPECIFICATIONS OF
C     TIME, TEMPERATURE, TOTAL SOIL MASS, FRACTION OF THE SOIL BURDEN IN
C     THE VAPOR PHASE, AND THE SIZE FREQUENCY DISTRIBUTION OF THE
C     CONDENSED PHASE SOIL OR AIRBURST PARTICLES.  IT ALSO PRINTS A
C     HEADING AND PRINTS THE CRITICAL DATA.
C
C ***********************************************************************
C
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VPR
      COMMON /PARTCL/ NDSTR,RHOP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
      EQUIVALENCE (DMEAN,CAYM),(SD,EXPO)
C
      DATA PROGRM /6H ICM  /
C
C ***********************************************************************
C
    1 FORMAT(12A6)
    2 FORMAT( /3X, 60HTHE SPECIFIED STANDARD DEVIATION IS NEGATIVE HENCE
     1 INCORRECT///)
    3 FORMAT(8F10.0)
    4 FORMAT( //25X, 28H****  BASIC PARAMETERS  ****/ 20X, 24HYIELDS - T
     1OTAL (FISSION), 21X, E12.5, 2H (E12.5, 4H) KT/ 20X, 24HHEIGHT OR D
     2EPTH OF BURST, 21X, E12.5, 2X, 6HMETERS, 2H (E12.5, 21H FEET) RELA
     3TIVE TO GZ/ 20X, 14HALTITUDE OF GZ, 31X E12.5, 7H METERS/ 20X,
     4 13HSOIL CATEGORY)
 5    FORMAT(1H+,65X,9HSILICEOUS)
 6    FORMAT(1H+,65X,10HCALCAREOUS)
 7    FORMAT( /20X,            36HPARTICLE SIZE FREQUENCY DISTRIBUTION/
     125X32HA LOG-NORMAL DISTRIBUTION WITH -/30X,15HMEDIAN DIAMETER,20X,
     2E12.5,2X,11HMICROMETERS/30X,28HGEOMETRIC STANDARD DEVIATION, 7X,
     3E12.5/25X, 34HTHIS DISTRIBUTION WAS SPECIFIED BY)
 8    FORMAT(1H+,65X,11HTHE PROGRAM)
 9    FORMAT(1H+,65X,8HTHE USER)
 10   FORMAT(20I4)
 11   FORMAT(/3X,58HTHE SCALED DEPTH OF BURST IS BEYOND THE SCOPE OF THE
     1 MODEL)
   12 FORMAT( 1H+, 65X, 36HNOT APPLICABLE.  THIS IS AN AIRBURST)
 13   FORMAT( //25X37H****  INITIAL CLOUD PROPERTIES AT H +E12.5,14H SEC
     1ONDS  ****/ 20X,23HAVERAGE GAS TEMPERATURE38X,E12.5,2X,14HDEGREES
     2KELVIN/ 20X,56HAVERAGE TEMPERATURE OF CONDENSED PHASE MATERIAL IN
     3CLOUD,5X,E12.5,2X,14HDEGREES KELVIN/ 20X,31HMASS OF VAPORIZED SOIL
     4 IN CLOUD,30X,E12.5,2X,9HKILOGRAMS/ 20X41HMASS OF CONDENSED PHASE
     5MATERIAL IN CLOUD,20X,E12.5,2X,9HKILOGRAMS)
 14   FORMAT( //25X37H****  INITIAL CLOUD PROPERTIES AT H +E12.5,14H SEC
     1ONDS  ****/ 20X,23HAVERAGE GAS TEMPERATURE38X,E12.5,2X,14HDEGREES
     2KELVIN/                                20X41HMASS OF CONDENSED PHASE
     3MATERIAL IN CLOUD,20X,E12.5,2X,9HKILOGRAMS)
 15   FORMAT(1X,11HLEAVING ICM)
   16 FORMAT( 1H1,   50X, 19H* * * * * * * * * *//55X,11HD E L F I C//
     1                                                 12X,101HT H E   D E P
     2A R T M E N T   O F   D E F E N S E   F A L L O U T   P R E D I C
```

```
     3T I O N   S Y S T E M//51X19H* * * * * * * * * *////43X,  36HINITIICM
     4ALIZATION AND CLOUD RISE MODULE///  55X, 11HPREPARED BY/ 46X,  30HICM
     5ATMOSPHERIC SCIENCE ASSOCIATES/  54X, 14HBEDFORD, MASS.////25X,   ICM
     630H****  RUN IDENTIFICATION  ****, 3X, 12A6)                       ICM
 17   FORMAT(/3X,60HTHE SPECIFIED MEAN PARTICLE SIZE IS NEGATIVE HENCE IICM
     1NCORRECT///)                                                       ICM
  18 FORMAT(1H0, 9X, 89HPARTICLE SIZE DISTRIBUTION SUPPLIED IN TABULAR ICM
     1FORM BY THE USER (DIAMETERS ARE IN METERS))                        ICM
  19  FORMAT( 20X, 24HFALLOUT PARTICLE DENSITY, 21X, E12.5,  8H KG/M**3)ICM
  20  FORMAT( 20X, 23HSCALED HEIGHTS OF BURST, 38X, E12.5, 7H FEET (,   ICM
     1 E12.5, 8H METERS))                                                ICM
  24 FORMAT( /20X,           38HPARTICLE VOLUME FREQUENCY DISTRIBUTION/ICM
     125X32HA LOG-NORMAL DISTRIBUTION WITH -/30X,15HMEDIAN DIAMETER,20X,ICM
     2E12.5,2X,11HMICROMETERS/30X,28HGEOMETRIC STANDARD DEVIATION, 7X,  ICM
     3E12.5)                                                             ICM
  25 FORMAT(1H09X,65HPARTICLE SIZE - MASS DISTRIBUTION TABLE (DIAMETERSICM
     1 ARE IN METERS))                                                   ICM
  26 FORMAT(/22X77H****  THE CONTROL VARIABLE ARRAY, IC(J), WAS GIVEN TICM
     1HE FOLLOWING VALUES  ****/ 19X, 20I4)                              ICM
  27 FORMAT(/20X, 36HPARTICLE MASS FREQUENCY DISTRIBUTION/ 25X, 31HA POICM
     1WER-LAW DISTRIBUTION WITH -/ 30X, 15HK-TO-MASS RATIO, 20X, 2PE12.5ICM
     2/ 30X, 21HEXPONENTIAL PARAMETER, 14X, 1PE12.5)                     ICM
  28 FORMAT(1H0, 11X, 63HTHE PARTICLE DISTRIBUTION ABOVE IS A SIZE-ACTIICM
     1VITY DISTRIBUTION)                                                 ICM
 192  FORMAT(//51X,19H* * * * * * * * * *//)                             ICM
 193 FORMAT( 10X, 33HNUMBER OF PARTICLE SIZE CLASSES =I5/                ICM
     1     1H0,20X, 8HDIAMETER, 4X,13HLOWER BOUNDRY, 5X, 8HFRACTION,     ICM
     2 5X,14HUPPER BOUNDARY/)                                            ICM
 194 FORMAT(12X,I3,4(3X,E12.5))                                          ICM
 195 FORMAT(2F10.0)                                                      ICM
 198 FORMAT(/3X,58HTHE PARTICLE SIZE DISTRIBUTION TABLE IS IMPROPERLY OICM
     2RDERED///)                                                         ICM
1400 FORMAT(                                           20X, 73HFRACTIOICM
     1N OF THE TOTAL EXPLOSION ENERGY IN THE CLOUD AT THE INITIAL TIME =ICM
     2F6.4/  20X, 51HFRACTION OF THIS ENERGY USED TO HEAT AIR AND SOIL =ICM
     3F6.4/  20X, 37HFRACTION  USED TO HEAT LIQUID WATER =F6.4/         ICM
     4                                         20X, 37HFALLOUT SOLIDICM
     5IFICATION TEMPERATURE = F8.3,  4H (K))                             ICM
1700 FORMAT(1H019X30HCLOUD SUBDIVISION PARAMETERS -/  23X, 52HNUMBER OFICM
     1 CLOUD SUBDIVISIONS IN THE VERTICAL (KDI) =I4/  23X, 48HPARCEL HORICM
     2IZONTAL SUBDIVISION PARAMETER (IRAD) =I4)                          ICM
1800 FORMAT(                                                             ICM
     120X22HDETONATION COORDINATES,10X,3HXGZ,13X,3HYGZ,13X,3HTGZ/       ICM
     244X,3(E13.6,3X))                                                   ICM
C                                                                        ICM
C                                                                        ICM
C ***********************************************************************ICM
C                                                                        ICM
C     READ RUN IDENTIFIER                                                ICM
      READ (ISIN,1)DETID                                                 ICM
C     READ CONTROL PARAMETERS                                            ICM
      READ(ISIN,10) IC                                                   ICM
C                                                                        ICM
C     WRITE OVERALL TITLE                                                ICM
      WRITE (ISOUT,16)DETID                                              ICM
      WRITE(ISOUT,26) IC                                                 ICM
C     READ IN BASIC DATA                                                 ICM
      READ(ISIN,3)W, FW, HEIGHT, ZBRSTZ, SLDTMP, PHI                     ICM
      IF(SLDTMP .EQ. 0.0  .AND.  IC(2) .EQ. 0) SLDTMP=2200.              ICM
      IF(SLDTMP .EQ. 0.0  .AND.  IC(2) .EQ. 1) SLDTMP=2800.              ICM
```

```
   40 IF(SLDTMP .LE. 0.0) CALL ERROR(PROGRM, -40, ISOUT)
      IF(PHI .EQ. 0.0) PHI=1.0
      READ(ISIN,10)NOSTR,KDI,IRAD
      IF( NOSTR .EQ. 0 ) NOSTR=100
      IF(KDI .EQ. 0) KDI=15+ALOG(W)
      READ(ISIN,3)XGZ,YGZ,TGZ
      IF(IC(1)-1)210,220,230
C 210 A LOGNORMAL PARTICLE DISTRIBUTION IS SPECIFIED
  210 READ(ISIN,3) DNS, DMEAN, SD
C     IS A LOGNORMAL DISTRIBUTION SPECIFIED BY THE USER
      IS=0
      IF(DMEAN.GT. 0.0) IS=1
      GO TO 23
C 220 A POWER-LAW PARTICLE DISTRIBUTION IS SPECIFIED
  220 READ(ISIN,3)DNS, CAYP, EXPO
      GO TO 23
C 230 A TABULAR PARTICLE DISTRIBUTION IS SPECIFIED
  230 READ(ISIN,3)DNS
      READ(ISIN,195)(DIAM(I),FMASS(I),I=1,NDSTR)
      LD=NDSTR+1
      READ(ISIN,195)DIAM(LD)
C
C     CHECK ORDERING OF THE HISTOGRAM TABLE
      DO 215 I=2,LD
      IF(DIAM(I) .LT. DIAM(I-1)) GO TO 215
      WRITE( ISOUT,198)
      GO TO 200
  215 CONTINUE
   23 HOB =  HEIGHT/0.3048
      IF( DNS .EQ. 0.0 ) DNS = 2.6
      RHOP=DNS*1000.
C     ZSCL IS THE SCALED HOB  -  DOB
      ZSCL = HOB /((W)**(1.0/3.4))
C
C     TEST THE SCALED HOB TO DETERMINE IF  SUBSURFACE, LOW AIRBURST
C     OR PURE AIRBURST
      IF(ZSCL+20.0 .LT. 0.0) GO TO 143
      IF(ZSCL .LT. 180.0) GO TO 70
      CALL AIRBRS
      GO TO 95
 70   CALL TIMEE
      CALL TEMP
      CALL MASS
      CALL VAPOR
      IF(IC(1)-1)90,95,95
C
C     TEST FOR ACCEPTABLE SPECIFICATIONS OF LOGNORMAL PARTICLE SIZE
C     DISTRIBUTION
 90   IF(SD)91,92,92
 91   WRITE (ISOUT,2)
      GO TO 200
   92 IF(DMEAN)94,95,95
 94   WRITE (ISOUT,17)
      GO TO 200
C
C     COMPUTE PARTICLE SIZE-VOLUME (MASS) FREQUENCY HISTOGRAM
 95   CALL DSTBN
      SSAM = SSAM - VPR
C     PRINT INITIAL CONDITIONS RESULTS
      WRITE(ISOUT,4)W,FW, HEIGHT,HOB,ZBRSTZ
```

```
      IF( ZSCL .LT. 180. ) IF(IC(2))301,301,302
      WRITE(ISOUT,12)
      WRITE( ISOUT, 14 ) TME, TMPG, SSAM
      GO TO 118
 301  WRITE (ISOUT,5)
      GO TO 108
 302  WRITE (ISOUT,6)
 108  WRITE(ISOUT,13)TME,TMPG,TMPS,VPR,SSAM
  118 ZSCM=ZSCL*0.3048
      WRITE(ISOUT,20)ZSCL,ZSCM
C     SET FRACTION OF EXPLOSION ENERGY IN THE CLOUD
      F=.45
      RPHI=1.0-PHI
      WRITE(ISOUT,1400) F,PHI,RPHI,SLDTMP
      WRITE(ISOUT,1800)XGZ,YGZ,TGZ
      WRITE(ISOUT,19) RHOF
      IF(IC(1)-1)309,310,311
  309 WRITE(ISOUT,7)DMEAN,SD
      IF (IS)102,103,102
 103  WRITE (ISOUT,8)
      GO TO 105
 102  WRITE (ISOUT,9)
  105 BARMU = EXP(ALOG(DMEAN) + 3.0*ALOG(SD)**2)
      WRITE(ISOUT,24)BARMU,SD
      WRITE(ISOUT,25)
      GO TO 315
  310 WRITE(ISOUT,27) CAYM, EXPO
      GO TO 315
  311 WRITE(ISOUT,18)
C
C     PRINT PARTICLE SIZE DISTRIBUTION TABLE
C
  315 WRITE(ISOUT,193)NDSTR
      DO 602 J=1,NDSTR
  602 WRITE(ISOUT,194)J,PS(J),DIAM(J+1),FMASS(J),DIAM(J)
C     CHECK IF PARTICLE DISTRIBUTION IS OF THE SIZE-ACTIVITY TYPE
      IF(IC(5) .EQ. 0) GO TO 603
      SD=-1.0
      WRITE(ISOUT,28)
  603 WRITE(ISOUT,1700)KCI,IRAD
      WRITE(ISOUT,192)
  200 WRITE(ISOUT,15)
      RETURN
 143  WRITE (ISOUT,11)
      GO TO 200
      END
```

```
*DECK,AIRBRS
      SUBROUTINE AIRBRS
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     COMBINES FUNCTIONS OF SUBROUTINES TIME, TEMP, MASS, AND VAPOR
C     FOR AN AIRBURST.  ALSO SETS LOGNORMAL DEBRIS PARTICLE SIZE
C     DISTRIBUTION PARAMETERS FOR AN AIRBURST.   A GEOMETRIC STANDARD
C     DEVIATION OF 2.0 IS ASSUMED.   THE MEDIAN PARTICLE DIAMETER WAS
C     COMPUTED FROM EQS. (43) AND (44) OF NATHANS,ET AL., JGR75, 7565
C     (1970) (FOR BROWNIAN MOTION)
C
C ***********************************************************************
C
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VPR
      COMMON /PARTCL/ NDSTR,RHOP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
C
C ***********************************************************************
C
C     SET TIME OF THE SECOND THERMAL MAXIMUM AND THE DELFIC INITIAL
C     TIME (SEC)
C
      T2M = 0.045 * W**(0.42)
      TME = 56. * T2M * W**(-0.30)
C
C     SET INITIAL CLOUD TEMPERATURE
C
      A = 6847. * W**(-0.0131)
      B = -0.4473 * W**(0.0436)
      TMPG = A * (TME / T2M)**B + 1500.
      TMPS = TMPG
C
C     SET MASS OF CONDENSED PHASE MATERIAL IN THE CLOUD (KG)
      SSAM = 90.718
      VPR = 0.0
      IF(IC(1) .NE. 0  .OR.  DMEAN .NE. 0.0) RETURN
C
C     SET DEBRIS PARTICLE SIZE DISTRIBUTION PARAMETERS
C
      SD = 2.0
      DMEAN = 0.15
      RETURN
      END
```

```
*DECK,DSTBN
      SUBROUTINE DSTBN
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     SETS UP HISTOGRAM TABLES OF  PARTICLE MASS AS A FUNCTION OF
C     PARTICLE DIAMETER.
C
C     LOGNORMAL DISTRIBUTION TO 100
C     POWER FUNCTION DISTRIBUTION TO 200
C     TABULAR DISTRIBUTION TO 300
C
C     EQUATION 26.2.23 OF NBS-AMS 55 HANDBOOK IS USED TO COMPUTE THE
C     PROBABILITY FUNCTION ARGUMENT FROM THE RATIONAL POLYNOMIAL
C     APPROXIMATION TO THE NORMAL PROBABILITY FUNCTION.
C
C ***********************************************************************
C
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VFR
      COMMON /PARTCL/ NDSTR,RHCP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
      EQUIVALENCE (DMEAN,CAYM),(SD,EXPO)
      DATA PROGRM, PI/ 6HDSTBN , 3.141592654/
C
C ***********************************************************************
C
      TA(X)=SQRT(ALOG(1.0/X**2))
      APX(X)=TA(X)-(2.515517+0.802853*TA(X)+0.010328*TA(X)**2)/
     1(1.0+1.432788*TA(X)+0.189269*TA(X)**2+0.001308*TA(X)**3)
C
      LD=NDSTR+1
      IF(IC(1)-1)100,200,300
  100 IF(DMEAN)111,111,112
  111 DMEAN=0.407
      SD=4.0
  112 IF(NDSTR-1)101,101,102
  101 PS(1)=DMEAN*1.0E-6
      C5=SD**5
      DIAM(1)=DMEAN*C5*1.0E-6
      DIAM(2)=DMEAN/C5*1.0E-6
      FMASS(1)=1.0
      GO TO 400
  102 BARMU=ALOG(DMEAN)
      SIGMA=ALOG(SD)
      BARMU=BARMU+3.*SIGMA**2
      FRAC=1.0/FLOAT(NDSTR)
      DO 103 ND=1,NDSTR
  103 FMASS(ND)=FRAC
      NH=NDSTR/2
      DO 104 I=1,NH
      PRB=FLOAT(I)*FRAC
      DIAM(I+1)=BARMU+APX(PRB)*SIGMA
      J=NDSTR-I+1
  104 DIAM(J)=BARMU-APX(PRB)*SIGMA
C
C     FOR THE 2 EXTREME INTERVALS THE AVERAGE DIAMETER IS
C     ASSUMED TO BE AT HALF A MASS FRACTION FROM ZERO AND ONE
C
```

```
      PRB=FRAC/2.0
      PS(1)=BARMU+APX(PRB)*SIGMA
      PS(NDSTR)=BARMU-APX(PRB)*SIGMA
      DIAM(1)=2.*PS(1)-DIAM(2)
      DIAM(LD)=2.*PS(NDSTR)-DIAM(NDSTR)
C
C     CALCULATE MEAN DIAMETERS FROM BOUNDARY VALUES
C
      J=NDSTR-1
      IF(J-1)107,107,105
  105 DO 106 I=2,J
  106 PS(I)=0.5*(DIAM(I)+DIAM(I+1))
  107 DO 108 I=1,NDSTR
      DIAM(I)=EXP(DIAM(I)) *1.0E-6
  108 PS(I)=EXP(PS(I))*1.0E-6
      DIAM(LD)=EXP(DIAM(LD)) *1.0E-6
      GO TO 400
  200 IF(EXPO .GE. 4.0) CALL ERROR(PROGRM, -200, ISOUT)
      AN=FLOAT(NDSTR)
      FRAC=1.0/AN
      DO 205 I=1,NDSTR
  205 FMASS(I)=FRAC
      POW=1.0/(4.0-EXPO)
      DMIN = (6.0*FRAC/(PI*RHOF*CAYM*POW))**POW
      DO 206 IJ=1,NDSTR
      AJ=IJ-1
  206 DIAM(IJ)=(AN-AJ)**POW*DMIN
      PS(NDSTR)=DMIN*0.5**POW
      DIAM(LD)=PS(NDSTR)**2/DIAM(NDSTR)
      ND=NDSTR-1
      DO 207 IJ=1,ND
  207 PS(IJ)=SQRT(DIAM(IJ)*DIAM(IJ+1))
      GO TO 400
  300 DO 301 I=1,NDSTR
  301 PS(I)=SQRT(DIAM(I)*DIAM(I+1))*1.0E-6
      DO 308 IJ=1,LD
  308 DIAM(IJ)=1.0E-6*DIAM(IJ)
  400 RETURN
      END
```

```
*DECK,MASS
      SUBROUTINE MASS
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C *********************************************************************
C
C     ESTIMATES  MASS OF FALLOUT IN THE FIREBALL FOR A SURFACE, LOW
C     AIRBURST OR SHALLOW SUBSURFACE BURST.
C
C *********************************************************************
C
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VPR
C
C ***************************************************C*****************
C
C     HOB  OR DOB
      IF(HEIGHT)230,240,240
  230 D=2.181595
      Q=-ZSCL
      R=1.125E+02+(7.55E-01)*Q-(9.6E-06)*(Q**3.0)-(9.11E-12)*(Q**5.0)
      S=3.27E+01+(8.51E-01)*Q-(2.52E-05)*(Q**3.0)+(1.78E-10)*(Q**5.0)
      SSAM= D*((W)**(3.0/3.4))*(R**2.0)*S
      GO TO 250
  240 E=0.07740685
      SSAM=E*((W)**(3.0/3.4))*((180.0-ZSCL)**2.0)*(360.0+ZSCL)
  250 RETURN
      END
```

```
*DECK,VAPOR
      SUBROUTINE VAPOR
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C *********************************************************************
C
C     ESTIMATES PORTION OF FALLOUT MASS (CALC. BY SR MASS) IN THE
C     VAPOR STATE AT THE INITIAL TIME
C
C *********************************************************************
C
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VPR
C
C *********************************************************************
C
C     BRANCH ON THE BASIS OF SOIL CATEGORY   -SILICEOUS TO 100,
C     CALCAREOUS TO 200
      IF(IC(2))100,100,200
C
C     IS THE COMPUTED VAPOR TEMPERATURE HIGHER THAN THE SILICEOUS SOIL
C     BOILING TEMPERATURE
  100 IF(TMPG-3000.0)120,120,110
  110 VPR=SSAM*0.00015*(TMPG-3000.0)
```

```
      GO TO 130
C
C     IS THE COMPUTED VAPOR TEMPERATURE HIGHER THAN THE CALCAREOUS SOIL
C     BOILING TEMPERATURE
  200 IF(TMPG-3100.0)120,120,115
  115 VPR=SSAM*0.00015*(TMPG-3100.0)
      GO TO 130
  120 VPR=0.0
  130 RETURN
      END
```

```
*DECK,TEMP
      SUBROUTINE TEMP
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1976
C
C ***********************************************************************
C
C     ESTIMATES TEMPERATURES OF CONDENSED AND VAPOR PHASE FALLOUT IN
C     THE FIREBALL  AT THE INITIAL TIME.
C
C ***********************************************************************
C
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VPR
C
C ***********************************************************************
C
C     COMPUTE VAPOR TEMPERATURE
      Q=ZSCL*W**(-.03921)
      T2M=0.037*((0.045/0.037)**(Q/180.))*(W**(0.49-(0.07*Q/180.)))
      A=5980.*((1.145)**(Q/180.))*((W)**(-0.03948+0.02637*Q/180.0))
      B=-0.4473*(W**(0.04360))
      TMPG=A*((TME/T2M)**B)+1500.0
C
C     COMPUTE TEMPERATURE OF CONDENSED PHASE MATTER
      TMPS = 200. * ALOG10(W) + 1000.
      RETURN
      END
```

```
*DECK,TIMEE
      SUBROUTINE TIMEE
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     SETS TIME (RELATIVE TO DETONATION) OF THE INITIAL CONDITIONS
C     SPECIFICATIONS
C
C ********************************************************************
C
      COMMON /BASIC/ W,FW,ZBRSIZ,HEIGHT,ZSCL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VPR
C
C ********************************************************************
C
      Q=ZSCL*W**(-.03321)
      T2M=0.037*((0.045/0.037)**(Q/180.))*(W**(0.49-(0.07*Q/180.)))
      TME=(56.0*T2M)/(W**(0.3))
      RETURN
      END
```

```
*DECK,ATMR
      SUBROUTINE ATMR
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     ATMR READS IN ATMOSPHERE TABLES
C
C     ATMOSPHERE TABLE GLOSSARY- UNITS ARE FOR THE SCALED ENTRIES
C
C   1   ALT - ALTITUDE ABOVE MSL (METERS)
C   2   ATP - TEMPERATURE (DEGREES KELVIN)
C   3   PRS - PRESSURE (PASCALS)
C   4   RLH - RELATIVE HUMIDITY (PERCENT)
C   5   RHO - DENSITY (KGM/M**3)
C   6   ETA - VISCOSITY (KGM/(M-SEC))
C
C   KATM=IC(4) IS THE ATMOSPHER DATA PRINT CONTROL
C
C ********************************************************************
C
      COMMON /ATMOS/ NAT, ALT(256),  ATP(256),  PRS(256), RLH(256),
     1         RHO(256), ETA(256), NHODO, ZV(100),  VX(100), VY(100)
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
C
      DIMENSION FMT(12),SCALE( 8),ATMSUB(6),ATMZRO(6),ATMMAX(6),AP(6)
      DIMENSION ATID(12)
      DATA PROGRM/6H ATMR /, ALIMIT/999999./
      DATA ATMSUB/-1000.,294.65,.1139E6,77.,1.347,.18206E-4/
      DATA ATMZRO/ 0.0,288.15,.10133E6, 77.,1.2250,.17894E-4/,
     1ATMMAX/50000.,270.65,.79779E2,4.0,.10269E-2,.17037E-4/
C
```

```
   20 FORMAT(20I4)
   30 FORMAT(12A6)
   40 FORMAT(8F10.0)
   44 FORMAT(1H1)
   46 FORMAT( 20X,28HATMOSPHERE IDENTIFICATION - 12A6//)
   47 FORMAT(  37X,10HATMOSPHERE,51X//7X,3HALT,11X,3HATP,11X,3HPRS,11X,3
     1HRLH,11X,3HRHO,11X,3HETA)
   48 FORMAT( /(6(2X,E12.5)))
C
C **********************************************************************
C
      READ(ISIN,30)ATID
      KATM = IC(4)
      IF(KATM .GT. 0) WRITE(ISOUT,44)
      WRITE(ISOUT,46)ATID
      IGO=0
      NBRNCH=1
      WATCOR=(1.-18./29.)/100.
C
C     READ OBJECT-TIME FORMAT
C
      READ(ISIN,30)FMT
C
C     READ SCALE AND ADJUSTMENT FACTORS
C
      READ(ISIN,40)SCALE
      DO 90 I=1,6
      IF(SCALE(I))90,91,90
   91 SCALE(I)=1.
   90 CONTINUE
C
C     READ ATMOSPHERE DATA SEQUENCE INDICIES
      READ(ISIN,20)N1,N2,N3,N4,N5,N6
C
C     READ ATMOSPHERE TABLE ENTRIES, SEQUENCE AND ADJUST THEM TO THE
C     PROPER UNITS, AND WHERE APPROPRIATE COMPUTE THOSE ENTRIES NOT
C     PROVIDED IN THE INPUT.   ETA NEED NOT BE INPUT.  EITHER PRS OR RHZ
C     (BUT NOT BOTH) NEEDS TO BE INPUT.
C
      I=0
  100 READ(ISIN,FMT)AP
      IF(AP(N1) .GE. ALIMIT) GO TO 105
      I = I+1
      ALT(I)=(AP(N1)+SCALE(7))*SCALE(1)
      ATP(I)=(AP(N2)+SCALE(8))*SCALE(2)
      PRS(I)=AP(N3)*SCALE(3)
      RLH(I)=AP(N4)*SCALE(4)
      RHO(I)=AP(N5)*SCALE(5)
      ETA(I)=AP(N6)*SCALE(6)
C
C     ARE SUCCESSIVE TABLE ENTRIES IN ORDER OF INCREASING ALTITUDE-
C
      IF(I.EQ.1) GO TO 70
      IF (ALT(I)-ALT(I-1)) 45,45,70
   45 IRROR=-45
      WRITE(ISOUT,40) ALT(I), ALT(I-1)
      GO TO 130
   70 IF(ETA(I) .GT.0.0) GO TO 1070
      ETA(I)=1.458E-6*ATP(I)**1.5/(110.4+ATP(I))
 1070 IF(PRS(I).GT.0.0) GO TO 73
```

```
      IF(RHO(I).GT.0.0) GC TO 72
   71 IRROR=-71
      GO TO 130
   72 ES= 611.*(273./ATP(I))**5.13* EXP(25.*(ATP(I)-273. )/ATP(I))
      PRS(I)= 286.79* RHO(I)*ATP(I) +ES*RLH(I)*WATCOR
      GO TO 100
   73 IF( HO(I).GT.0.0) GO TO 100
      ES= 611.*(273./ATP(I))**5.13* EXP(25.*(ATP(I)-273. )/ATP(I))
      RHO(I)= (PRS(I)-ES*RLH(I)*WATCOR)/(286.79*ATP(I))
      GO TO 100
C
  105 NAT=I
C
C     DETERMINE IF THE TABLE MUST BE EXPANDED TO 256 ENTRIES
C
  110 IF(NAT -256)140,111,120
C
C 111 THE TABLES DO NOT NEED EXPANSION.  CHECK TO DETERMINE IF THE
C     TABLES HAVE THE PROPER BOUNDRIES.
C
  111 IF(ABS(ALT(1)+ 1000.).LE.1.) GO TO 113
  112 IRROR=-112
      GO TO 130
  113 IF(ABS(ALT(256)-5.E4).LE.50.) GO TO 115
  114 IRROR=-114
      GO TO 130
C
C 115 THE TABLES HAVE THE PROPER BOUNDRIES.  CHECK TO DETERMINE IF THE
C     ALTITUDE INTERVALS ARE ALL 200 METERS.
C
  115 DO 116 I=2,256
      IF(ABS(ALT(I)-ALT(I-1)-200.).GT.2.) IF(NBRNCH-1) 140,140,137
  116 CONTINUE
      GO TO 270
  120 IRROR=-120
  130 CALL ERROR(PROGRM,IRROR,ISOUT)
  137 IRR   -137
      GO    130
C
C 140 THE TABLES NEED EXPANSION OR INTERVAL ADJUSTMENT
C
  140 REWIND IRISE
C
C     DO THE TABLES BEGIN AT -1000 METERS-
C     IF NOT MAKE AN ENTRY AT -1000 METERS FROM THE ARDC STANDARD ATMOS.
C
      IF(ABS(ALT(1)+1000.) .GT. 1.) GO TO 150
      ALT(1)=-1000.
      GO TO 200
  150 WRITE(IRISE)ATMSUB
  160 IGO=IGO+1
C
C     DO THE TABLES HAVE AN ENTRY AT      0 METERS-
C     IF NOT MAKE AN ENTRY AT      0 METERS FROM THE ARDC STANDARD ATMOS.
C
      IF(ALT(1)    .LE. 0.0(1)GO TO 200
      WRITE(IRISE)ATMZRO
      IGO=IGO+1
C
C     STORE THE INPUT TABLES ON TAPE
```

```
C
  200 DO 210 I=1,NAT
  210 WRITE(IRISE)ALT(I),ATP(I),PRS(I),RLH(I),RHO(I),ETA(I)
C
C     DO THE TABLES HAVE AN ENTRY AT 50000 METERS-
C     IF NOT MAKE AN ENTRY AT 50000 METERS FROM THE ARDC STANDARD ATMOS.
C
      IF(ALT(NAT ) .GE. 5.E4) GO TO 220
      IF(ABS(ALT(NAT )-5.E4).LE.50.)GO TO 220
      WRITE(IRISE)ATMMAX
      NAT=NAT+1
C
C     INITIALIZE FOR THE TABLES EXPANSION
C
  220 REWIND IRISE
      NAT=NAT+IGO
      IF(NAT -256)222,222,221
  221 IRROR=-221
      GO TO 130
  222 DALT=200.
      NA=1
      READ(IRISE)ALT(1),ATP(1),PRS(1),RLH(1),RHO(1),ETA(1)
      A1=ALT(1)
      A2=ATP(1)
      A3=PRS(1)
      A4=RLH(1)
      A5=RHO(1)
      A6=ETA(1)
C
C     EXPAND THE TABLES TO 256 ENTRIES IN 200 METERS INTERVALS IN
C     ALTITUDE FROM -1000 TO 50000 METERS BY LINEAR INTERPOLATION
C     FROM THE  INPUT TABLES
C
      DO 260 I=2,256
      ALT(I)=ALT(I-1)+DALT
  225 IF(A1.GE.ALT(I))GO TO 250
      IF(ALT(I)-A1 .LT. 2.) GO TO 250
      NA=NA+1
      IF(NAT - NA .GE. 0)GO TO 240
  230 IRROR=-230
      GO TO 130
  240 READ(IRISE)A1,A2,A3,A4,A5,A6
      GO TO 225
  250 TERP=  DALT      /(A1-ALT(I-1))
      ATP(I)=ATP(I-1)+TERP*(A2-ATP(I-1))
      PRS(I)=PRS(I-1)+TERP*(A3-PRS(I-1))
      RLH(I)=RLH(I-1)+TERP*(A4-RLH(I-1))
      RHO(I)=RHO(I-1)+TERP*(A5-RHO(I-1))
      ETA(I)=ETA(I-1)+TERP*(A6-ETA(I-1))
  260 CONTINUE
      NAT=256
      NBRNCH=2
      GO TO 111
  270 IF(KATM .EQ. 0) RETURN
      WRITE(ISOUT,47)
      WRITE(ISOUT,48 )(ALT(I),ATP(I),PRS(I),RLH(I),RHO(I),ETA(I),
     1   I=KATM,NAT,KATM)
      RETURN
      END
```

```
*DECK,SHWIND
      SUBROUTINE SHWIND
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     READS IN SHOT TIME WIND DATA ABOVE GROUND ZERO
C     THESE WINDS ARE USDE TO COMPUTE WIND SHEAR EFFECTS ON CLOUD RISE
C     AND TO TRANSPORT THE CLOUD AND FALLOUT WHILE THE CLOUD RISES AND
C     STABILIZES.
C
C ********************************************************************
C
       COMMON /ATMOS/ NAT, ALT(256),  ATP(256),  PRS(256), RLH(256),
     1        RHO(256), ETA(256), NHODO, ZV(100),  VX(100), VY(100)
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KOI
C
      INTEGER FORM,METEOR,RESOLV
      DIMENSION SCALE(5),AP(3),FMT(12)
      DATA ALIMIT  , RADC      , PROGRM  , METEOR , RESOLV
     1  /  999999. ,.0174532925, 6HSHWIND, 4HMETE , 4HRESO /
C
    1 FORMAT(20I4)
    2 FORMAT( 1H1, 37X, 19HSHOT-TIME WIND DATA// 19X, 8HRAW DATA, 36X, 1
     14HPROCESSED DATA// 8X, 1HZ, 9X, 10HVX OR DIR., 3X, 11HVY OR SPEED,
     2 14X, 1HZ, 12X, 2HVX, 12X, 2HVY/)
    3 FORMAT( 3(2X,1PE12.5))
    4 FORMAT( 1H+, 47X, 3(2X,1PE12.5))
    5 FORMAT( 1H , 9X, 39HSHOT-TIME WINDS HAVE NOT BEEN SPECIFIED)
    6 FORMAT( 3F10.0)
    7 FORMAT( 12A6)
   8  FORMAT(6X, A4)
C
C ********************************************************************
C
      NHODO=0
      TRNS=0.
COPY IN DATA TYPE INDICATOR AND FORMAT
      READ(ISIN,8) FORM
      READ(ISIN,7) FMT
      WRITE(ISOUT,2)
COPY IN WIND DATA SCALE FACTORS AND DATA POINTERS
      READ(ISIN,6) SCALE
      READ(ISIN,1) N1, N2, N3
      DO 9 I=1,3
    9  IF( SCALE(I) .EQ. 0.0 ) SCALE(I) = 1.0
      IF(FORM .EQ. METEOR) TRNS=SCALE(3)*SCALE(5) - 180.
COPY IN WIND DATA
  100 READ(ISIN,FMT)AP
      IF(AP(N1) .GE. ALIMIT) GO TO 200
      NHODO = NHODO+1
COPY OUT RAW WIND DATA
      WRITE(ISOUT,3)AP(N1), AP(N2), AP(N3)
  10  IF(NHODO .GT. 100) CALL ERROR( PROGRM, -10, ISOUT)
COMPUTE SCALED WIND DATA
      ZV(NHODO) = ( AP(N1)    + SCALE(4))*SCALE(1)
      IF(FORM .EQ. RESOLV) GO TO 15
      VX(NHODO)=AP(N3)*SCALE(2)*SIN(RADC*(AP(N2)*SCALE(3) + TRNS))
      VY(NHODO)=AP(N3)*SCALE(2)*COS(RADC*(AP(N2)*SCALE(3) + TRNS))
```

```
      GO TO 50
  15  VX(NHODO)=AP(N2)*SCALE(2)
      VY(NHODO)=AP(N3)*SCALE(2)
COPY OUT SCALED WIND DATA
   50 WRITE(ISOUT,4)ZV(NHODO),VX(NHODO), VY(NHODO)
      GO TO 100
  200 IF(NHODO .GT. 0) RETURN
      WRITE(ISOUT,5)
      RETURN
      END
```

```
*DECK,CPFR
      SUBROUTINE CPFR
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     CPFR COMPUTES PARTICLE FALLOUT RATE
C
C ***********************************************************************
C
      COMMON /CLOUD/ CHANGE,CMLR  ,C2    ,C3    ,C6    ,DEK   ,DRM   ,
     1 DS    ,DST   ,DST0  ,DST1  ,DST2  ,DT    ,DU    ,DWT   ,DX    ,
     2 DZ    ,ED    ,EK    ,EPS   ,ES    ,HLK   ,KS    ,KSV   ,MWYA  ,
     3 N     ,NNN   ,P     ,PW    ,R     ,RA    ,RL    ,RM    ,RZT   ,
     4 S     ,SAVE  ,SHAPE ,SMALLT,T     ,TE    ,U     ,V     ,WT    ,
     5 X     ,XE    ,Z     ,ZBFR  ,ZLMT  ,SPARE
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
      COMMON /PARTCL/ NDSTR,RHCP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)
C
      DIMENSION Y(200),CG(200)
      EQUIVALENCE (Y(1),GDPST(1)), (CG(1),GDPST(201))
C
  903 FORMAT (1H1//////////
     1  20X30HNEGATIVE PARTICLE DENSITY                        //////)
  758 FORMAT(1H124X73H* * * * * * * * * * * * * * * * * * * * * * * * *
     1* * * * * * * * * * * * * *//  22X, 76HPARTICLE SETTLING RATES ARE INA
     2CCURATE.  DAVIES NUMBER IS TOO LARGE FOR THE I3, 8H TH SIZE// 24X,
     3 73H* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     4* * * * * * *////)
C
C ***********************************************************************
C
C                                     TEST FOR IMPOSSIBLE PARTICLE
      DO 901 J=1,NDSTR
          IF(Y(J)) 902, 901, 901
901       CONTINUE
          GO TO 900
  902 WRITE(ISOUT,903)
      MWYA = 3
      GO TO 908
900       CONTINUE
C
C     COMPUTE PARTICLE FALLOUT RATES
```

```
C
      VIS=1.458E-6*T**1.5/(110.4+T)
      DO 3 J=1,NDSTR
      CALL SETTLE(PS(J), RHOP, RA, VIS, T, P, CG(J), IACCR)
      IF(MWYA.EQ. 1  .AND.  IACCR .NE. 0) WRITE(ISOUT,758) J
    3 CONTINUE
C
C     COMPUTE OVERALL LOSS RATE OF FALLOUT FROM THE CLOUD AND ADJUST
C     IN-CLOUD PARTICLE CONCENTRATIONS
C
      CMLR=0.
      A=3.1415927*R**2*DST
      DO 1 J=1,NDSTR
      C=0.5235988*PS(J)**3
      D=A*CG(J)
      CMLR=CMLR+C*D*Y(J)
    1 Y(J)=Y(J)*(1.-D/V)
      CMLR=CMLR*RHOP/DST
  008 RETURN
      END




*DECK,CRM
      SUBROUTINE CRM
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ************************************************************ *****
C
C     COMPUTE THE DYNAMIC CLOUD RISE
C
C     THIS CODE CLOSELY FOLLOWS THAT OF HUEBSCH, 'THE DEVELOPMENT OF A
C     WATER-SURFACE-BURST FALLOUT MODEL - THE RISE AND EXPANSION OF THE
C     ATOMIC CLOUD',USNRDL-TR-74[illegible] (23 APRIL 1964), AND 'TURBULENCE,
C     TOROIDAL CIRCULATION AND DISPERSION OF FALLOUT FROM THE RISING
C     NUCLEAR CLOUD', USNRDL-TR1054 (5 AUGUST 1966).  THE HUEBSCH MODEL
C     HAS BEEN MODIFIED AS DESCRIBED BY NORMENT, 'VALIDATION AND
C     REFINEMENT OF THE DELFIC CLOUD RISE MODULE', DNA 4320F(15JAN1977)
C
C *****************************************************************
C
      COMMON /CLOUD/ CHANGE,CMLR  ,C2    ,C3    ,C6    ,DEK   ,DRM   ,
     1 DS    ,DST   ,DST0  ,DST1  ,DST2  ,DT    ,DU    ,DWT   ,DX    ,
     2 DZ    ,ED    ,EK    ,EPS   ,ES    ,HLR   ,KS    ,KSV   ,MWYA  ,
     3 N     ,NNN   ,P     ,PW    ,R     ,RA    ,RL    ,RM    ,RZT   ,
     4 S     ,SAVE  ,SHAPE ,SMALLT,T     ,TE    ,U     ,V     ,WT    ,
     5 X     ,XE    ,Z     ,ZBFR  ,ZLMT  ,SPARE
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
      COMMON /PARTCL/ NDSTR,RHOP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)
C
      DIMENSION Y(200)
      EQUIVALENCE (Y(1),GDPST(1))
C
C *****************************************************************
C
C     COMPUTE THE PARTIAL PRESSURE OF THE WATER VAPOR IN THE CLOUD
```

```
C
   35 PW=P*X*29./(18.+29.*X)
C
C     COMPUTE SATURATION WATER VAPOR PRESSURE AND CLOUD AIR MASS
C
      ES=611.*(T/273.)**(-5.13)*EXP((25.*(T-273.))/T)
      PA=RM/V*(1.+X)/(1.+X+S+WT)
C
C     WET OR DRY EQUATIONS
C
      GO TO (150,1531,1531),N
  150 IF(ES-PW)152,152,1531
C
C     STORE VARIABLES(KSV=1) OR RESTART AT PREVIOUS TIME STEP (KSV=2)
C
  152 KSV=2
 1532 CALL RSTR
    9 VTEMPY=V
C
C     INTEGRATE
C
      CALL RKGILL
C
C         ADJUST IN-CLOUD PARTICLE CONCENTRATIONS TO BE CONSISTENT WITH
C     CLOUD VOLUME CHANGE
C
      DO 86 J=1,NOSTR
   86 Y(J)=Y(J)*VTEMPY/V
C
C     ACCUMULATE CLOUD TIME
C
      SMALLT=SMALLT+DST
C
C     TEST FOR TIME STEP CHANGE
      IF(ABS(SMALLT-1.0).LT.0.001)GO TO 87
      IF(SMALLT-1.0)8,87,88
   87 DST=DST1
   88 R=SQRT(3.*V/(RZT*12.566370bE0))
      GO TO 35
C
C     COMPUTE PARTICLE FALLOUT RATE
C
 1531 CALL CPFR
      GO TO (901,901,8),MWY
  901 IF(IC(6) .NE. 0) CALL DBG
      CALL DCSN
    8 CALL CXPN
      GO TO (724,724,148),MWYA
  724 KSV=1
      GO TO 1532
  148 CALL CRMW
      RETURN
      END
```

```
*DECK,CRMINT
      SUBROUTINE CRMINT
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     INITIALIZE CLOUD AND PARTICLE VARIABLES FOR THE DYNAMIC CLOUD RISE
C
C ***************************************************************Q*******
C
      COMMON /ATMOS/ NAT, ALT(256),  ATP(256),  PRS(256), RLH(256),
     1        RHO(256), ETA(256), NHODO, ZV(100),  VX(100), VY(100)
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLDTMP,TPSD,XGZ,YGZ,TGZ
      COMMON /CLOUD/ CHANGE,CMLR  ,C2    ,C3    ,C6    ,DEK   ,DRM   ,
     1 DS    ,DST   ,DST0  ,DST1  ,DST2  ,DT    ,DU    ,DWT   ,DX    ,
     2 DZ    ,ED    ,EK    ,EPS   ,ES    ,HLR   ,KS    ,KSV   ,MWYA  ,
     3 N     ,NNN   ,P     ,PW    ,R     ,RA    ,RL    ,RM    ,RZT   ,
     4 S     ,SAVE  ,SHAPE ,SMALLT,T     ,TE    ,U     ,V     ,WT    ,
     5 X     ,XE    ,Z     ,ZBFR  ,ZLMT  ,SPARE
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VFR
      COMMON /PARTCL/ NDSTR,RHOP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)
C
      DIMENSION Y(200),CG(200)
      EQUIVALENCE (Y(1),GDPST(1)), (CG(1),GDPST(201))
C
C ***********************************************************************
C
      CHANGE=100.
      CMLR=0.
      SMALLT=0.
      WT=0.
      N=1
      MWYA=1
      KS = 0
      DST0 = .03125
      DST1 = 0.25
      DST2 = 2.5
      DST=DST0
      SSAM=SSAM+VPR
C     COMPUTE TURBULENCE DRAG PARAMETER
C
      C2 = AMAX1( 0.004, AMIN1( 0.100, 0.1 * W**(-0.3333333333) ))
C     SET TURBULENT ENERGY DISSIPATION PARAMETER
C
      C3=0.175
      C6=1.0
C
      T=TMPG
C
C     COMPUTE CLOUD CENTER HEIGHT, VOLUME, RADII, INITIAL MIXING RATIOS
C
      Z=HEIGHT+ZBRSTZ+ 90.*W**0.3333333333
      CALL TRPL(Z,NAT ,ALT,ATP,TE)
      CALL TRPL(Z,NAT ,ALT,PRS,P)
      CALL TRPL(Z,NAT ,ALT,RLH,HLR)
      XE=109.98*HLR*(TE/273.)**(-5.13)*EXP((25.*(TE-273.))/TE)/(P*29.)
C
      TAD=0.
```

```
      IF(TMPS-848.)5,5,6
    5 TPR=TMPS
      GO TO 7
    6 TPR=848.
      TAD=1013.8*(TMPS-TPR)+0.06755*(TMPS**2-TPR**2).
    7 SOILHT=SSAM*(TAD+781.6*(TPR-TE)+0.2856*(TPR**2-TE**2)+
     11.381E+7*(1./TPR-1./TE))
      TAD=0.
      TPR=T
      IF(TPR-2300.)17,17,16
   16 TAD= -3587.5*(TPR-2300.) + 1.0625*(TPR**2-(2300.)**2)
      TPR=2300.
   17 FQ=4.18E12*F*W-SOILHT
      RMAO=PHI*FQ/(TAD+946.6*(TPR-TE)+0.09855*(TPR**2-TE**2)+XE*(1697.66
     1 *(T-TE) +0.572087*(T**2-TE**2)))
      RMWO=FQ*(1.-PHI)/(1697.66*(T-TE)+0.572087*(T**2-TE**2)+2.5E6)
     1  +RMAO*XE
      X=RMWO/RMAO
      RM=RMAO+RMWO+SSAM
      S=SSAM/RMAO
      V=(RMAO+RMWO)*287.*T*(1.+29.*X/18.)/(P*(1.+X))
      R=0.
C     SET SHAPE SO THAT THE CLOUD IS AN OBLATE ELLIPSOID WITH
C     ECCENTRICITY=0.75     COMPUTE HORIZONTAL AND VERTICAL CLOUD RADII
      SHAPE = 0.66144
C
      IF(V.GT.0.0) R=(3.*V/(12.5663706* SHAPE ))**(1.0/3.0)
      RZT= SHAPE *R
C     COMPUTE INITIAL RISE VELOCITY
C
      U=1.2*SQRT(9.8*R)
C     COMPUTE INITIAL TURBULENT KINETIC ENERGY DENSITY
C
      EK=0.5*U**2
C     COMPUTE INITIAL TURBULENT ENERGY LOSS RATE
C
      EPS=C3*(2.*EK)**1.5/RZT
C     COMPUTE ENTRAINMENT PARAMETER
C
      RL = AMAX1( AMAX1( 0.12, 0.1 * W**0.1 ), 0.01*W**0.3333333333 )
C
C     COMPUTE INITIAL IN-CLOUD PARTICLE CONCENTRATIONS
C
      Q=S/(1.0+X+S)*RM/(V*RHOP*0.5235988)
      DO 801 J=1,NDSTR
      Y(J)=FMASS(J)*Q/PS(J)**3
  801 CG(J)=0.
C     UPPER LIMIT FOR Z TO PREVENT PROGRAM RUNAWAY
C
      ZLMT=10000.0*W**0.25 + HEIGHT + ZBRSTZ
      RETURN
      END
```

```
*DECK,CRMW                                                              CRMW
      SUBROUTINE CRMW                                                   CRMW
C                                                                       CRMW
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978     CRMW
C                                                                       CRMW
C ***********************************************************************CRMW
C                                                                       CRMW
C     CRMW PRINTS SUMMARY OF OUTPUT OF THE CLOUD RISE MODULE.           CRMW
C                                                                       CRMW
C ***********************************************************************CRMW
C                                                                       CRMW
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KOI  CRMW
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)                     CRMW
C                                                                       CRMW
    8 FORMAT(1H1///8X,42HCLOUD RISE AND GROWTH HISTORY FOR RUN *** 12A6)CRMW
   20 FORMAT(/                                                          CRMW
     1  49X19HCLOUD HISTORY TABLE//                                     CRMW
     1  5X5(3X5HCLOUD, 3X), 3X4HBASE, 8X3HTOP, 7X6HRADIAL,              CRMW
     2  3X11HTEMPERATURE,4X, 3HGAS/                                     CRMW
     3  8X4HTIME, 5X8HINTERVAL, 5X4HBASE, 8X3HTOP, 6X6HRADIUS,          CRMW
     4  3X3(3X4HRATE, 4X), 14X, 7HDENSITY/                              CRMW
     5  5X2(3X5H(SEC), 3X), 3(4X3H(M), 4X), 3(2X7H(M/SEC), 2X),4X,      CRMW
     6  3H(K),5X10H (KG/M**3)// (1XI2, 1H), 1X,   10E11.4))             CRMW
C                                                                       CRMW
C ***********************************************************************CRMW
C                                                                       CRMW
      WRITE(ISOUT,6) DETID                                              CRMW
      WRITE(ISOUT,20)(J,(CX(J,I),I=1,10),J=1,MCX)                       CRMW
      RETURN                                                            CRMW
      END                                                               CRMW
```

```
*DECK,CXPN
      SUBROUTINE CXPN
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C     CXPN TABULATES THE CLOUD RISE AND EXPANSION OUTPUT TABLE ARRAY CX
C     AND TESTS FOR R-RATE, U,EK, AND MCX SHUT-OFF
C
C ********************************************************************
C
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /CLOUD/ CHANGE,CMLR  ,C2    ,C3    ,C6    ,DEK   ,DRM   ,
     1 DS     ,DST   ,DST0  ,DST1  ,DST2  ,DT    ,DU    ,DWT   ,DX    ,
     2 DZ     ,ED    ,EK    ,EPS   ,ES    ,HLR   ,KS    ,KSV   ,MWYA  ,
     3 N      ,NNN   ,P     ,PW    ,R     ,RA    ,RL    ,RM    ,RZT   ,
     4 S      ,SAVE  ,SHAPE ,SMALLT,T     ,TE    ,U     ,V     ,WT    ,
     5 X      ,XE    ,Z     ,ZBFR  ,ZLMT  ,SPARE
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KOI
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VPR
      COMMON /TABLES/ MCX, CX(50,10), GOPST(10,100)
C
      DATA WORD1, WORD2, WORD3 /6HR RATE, 6H MCX  , 6H U,EK /
C
 5000 FORMAT(/////10X,46HCLOUD RISE IS TERMINATED IN CXPN AT STATEMENT I
     14, 8H BY THE A6, 7H SWITCH///)
C
C ********************************************************************
C
C     PERFORM FIRST PASS INITIALIZATION
C
      GO TO (002, 020, 040), MWYA
  002 DO 004 MJ = 1, 10
      DO 004 MI = 1, 50
  004 CX (MI, MJ) = 0.0
      MCX = 1
      MWYA = 2
      DLTM = 0.0
      TSTM = SMALLT
      TSRE = AMAX1(10., AMIN1( 23. + 9. * ALOG10( W ), 60. ))
      TSRD=EXP(0.014778*ALOG(W)-7.0499)
      ZBFR = Z
      GO TO 040
C
C     IS IT TIME TO RECORD CLOUD STATUS IN THE CX ARRAY
C        YES - TO 040
C        NO - TO 070
C
      IF ( SMALLT - TSTM ) 070, 040, 040
  040 CX (MCX, 1) = SMALLT
      IF (Z - ZBFR) 041, 042, 042
  041 ZA = ZBFR
      GO TO 043
  042 ZA = Z
  043 CX (MCX, 5) = Z
      CX (MCX, 9) = T
      CX(MCX,10)=RA
C                                          TEST TO END CRF COMPUTATION
      IF( MCX .LE. 5 ) GO TO 543
```

```
      IF( TSRD .LT. TSTR  .OR.  U .GT. 0.0 ) GO TO 343
  243 MWYA = 3
      NSTAT=243
      WRITE(ISOUT,5000)NSTAT,WORD1
      GO TO 543
  343 IF( TSRE .LT. EK  .OR.  U .GT. 0.0 ) GO TO 543
  443 MWYA = 3
      NSTAT=443
      WRITE(ISOUT,5000)NSTAT,WORD3
  543 CX (MCX, 3) = ZA - RZT
      CX (MCX, 4) = ZA + RZT
  060 MCX = MCX + 1
C                                                CHECK CAPACITY OF ARRAY CX
      IF (MCX - 50) 062, 062, 061
  061 MWYA = 3
      NSTAT=61
      WRITE(ISOUT,5000)NSTAT,WORD2
  062 CXM = MCX
C
C     COMPUTE THE TIME AT WHICH THE NEXT CX ARRAY ENTRIES ARE TO BE MADE
C
      DLTM = DLTM + CXM * .084946
      TSTM = TSTM + DLTM
  065 IF (Z - ZBFR) 068, 068, 067
  067 ZBFR = Z
  068 GO TO (070, 070, 100), MWYA
  070 RETURN
C                                                COMPLETE OUTPUT CX TABLE
  100 MCX = MCX - 1
      IF (CX (MCX - 1, 1) - CX (MCX, 1)) 102, 106, 102
  102 DO 104 MK = 2, MCX
C                                                COMPUTE TIME INTERVAL LENGTH
      CX (MK - 1, 2) = CX (MK, 1) - CX (MK - 1, 1)
C                                                COMPUTE VERTICAL RATES
      CX (MK - 1, 6) = (CX (MK, 3) - CX (MK - 1, 3)) / CX (MK - 1, 2)
      CX (MK-1, 7) = (CX (MK, 4) - CX(MK-1, 4)) / CX (MK-1, 2)
C                                                COMPUTE RADIAL RATE
  104 CX (MK - 1, 8) = (CX (MK, 5) - CX (MK - 1, 5)) / CX (MK - 1, 2)
      DO 106 ML = 1, MCX
  106 CX (ML, 1) = CX (ML, 1) + TME
      GO TO 070
      END
```

```
*DECK,DBG
      SUBROUTINE DBG
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C *********************************************************************
C
C     CRM DEBUG PRINTOUT
C
C *********************************************************************
C
      COMMON /CLOUD/ CHANGE,CMLR   ,C2     ,C3     ,C6     ,DEK    ,DRM    ,
     1 DS     ,DST    ,DST0   ,DST1   ,DST2   ,DT     ,DU     ,DWT    ,DX     ,
     2 DZ     ,ED     ,EK     ,EPS    ,ES     ,HLR    ,KS     ,KSV    ,MWYA   ,
     3 N      ,NNN    ,P      ,PW     ,R      ,RA     ,RL     ,RM     ,RZT    ,
     4 S      ,SAVE   ,SHAPE  ,SMALLT,T      ,TE     ,U      ,V      ,WT     ,
     5 X      ,XE     ,Z      ,ZBFR   ,ZLMT   ,SPARE
      COMMON /CONTRL/ DETIO(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
      COMMON /PARTCL/ NOSTR,RHOP,DMEAN,SO,PS(200),DIAM(201),FMASS(200)
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)
C
      DIMENSION Y(200),CG(200)
      EQUIVALENCE (Y(1),GDPST(1)), (CG(1),GDPST(201))
C
  016 FORMAT (1H0 /
     1   3X1P9E13.4 /
     2   (10X1H*, 5X8E13.4))
   17 FORMAT(21X,*PS*,11X,*CG*,11X,*Y*,11X,*PS*,11X,*CG*,11X,*Y*/16X,1P6
     1E13.4)
  099 FORMAT (1H0 / 49X17HCLOUD DEBUG PRINT //
     1   9X2HST, 11X1HU, 12X1HX, 12X1HT, 12X1HR, 12X1HZ, 12X2HEK,
     2   11X1HV, 12X2HWT / 10X1H*, 11X2HTE, 11X2HRM, 11X2HES,
     3   11X1HP, 12X2HPW, 11X2HED, 10X3HRLH, 11X1HS/
     4   10X1H*, 10X3HEPS, 10X3HRZT , 9X4HCMLR,///)
C
C *********************************************************************
C
      IF (AMOD (SMALLT, 13.0)) 2146, 1149, 2146
 1149 WRITE(ISOUT,99)
 2146 IF (SMALLT) 1146, 1146, 3146
 3146 IF(SMALLT-AINT(SMALLT))149,4146,149
 4146 IF(AMOD(SMALLT,2.0))1146,149,1146
 1146 WRITE(ISOUT,16)
     1   SMALLT, U, X, T, P, Z, EK, V, WT,
     2   TE, RM, ES, P, PW, ED, HLR, S,
     3   EPS, RZT , CMLR
      WRITE(ISOUT,17)
     1   (PS  (I), CG (I), Y (I),
     2   PS  (I + 1), CG (I + 1), Y (I + 1),
     3 I=1,NOSTR,2)
  149 RETURN
      END
```

```
*DECK,DCSN
      SUBROUTINE DCSN
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     DCSN DETERMINES AT THE END OF EACH TIME STEP WHETHER TO
C     CONTINUE THE CRM COMPUTATION
C
C ********************************************************************
C
      COMMON /CLOUD/ CHANGE,CHLR  ,C2    ,C3    ,C6    ,DEK   ,DRM   ,
     1 DS    ,DST   ,DST0  ,DST1  ,DST2  ,DT    ,DU    ,DWT   ,DX    ,
     2 DZ    ,ED    ,EK    ,EPS   ,ES    ,HLR   ,KS    ,KSV   ,MWYA  ,
     3 N     ,NNN   ,P     ,PW    ,R     ,RA    ,RL    ,RM    ,RZT   ,
     4 S     ,SAVE  ,SHAPE ,SMALLT,T     ,TE    ,U     ,V     ,WT    ,
     5 X     ,XE    ,Z     ,ZBFR  ,ZLMT  ,SPARE
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KDI
C
 066 FORMAT(14H0SWITCH TO DRY)
 077  FORMAT(14H0SWITCH TO WET)
 088 FORMAT(1H1, 9X, 46HCLOUD RISE IS TERMINATED IN DCSN AT STATEMENT I
    14, 8H BY THE A6, 7H SWITCH///)
C
      DATA WORD1,       WORD3,WORD4 /6H TEMP ,          6H ZLMT ,6HR.LT.1/
C
C ********************************************************************
C
      GO TO (151,154,1531),N
C
C       SHOULD WE SWITCH TO WET MODE---
C              YES-- TO 041
C
 1531 IF(ES-PW)041,041,008
C
  041  N=2
      IF(IC(5))151,151,1041
 1041 WRITE(ISOUT,77)
       GO TO 151
C
C 154 SHOULD WE SWITCH TO DRY MODE-
C        NO TO 151
C
  154 IF(WT + 1.0E-8)153,153,151
  153 N=1
      WT=0.
      DWT=0.
      IF(IC(5))151,151,152
  152 WRITE(ISOUT,66)
C
C     TEST FOR TIME STEP CHANGE
C
  151 IF (SMALLT - CHANGE) 014, 015, 015
  015  DST=DST2
C
C     TEST FOR ANOMALOUS CLOUD RISE AND SET UP TERMINATION CONDITION IF
C     ANOMALY IS FOUND
C
```

```
C
C
 014 IF(ABS(T)-10.)114,20,20
 114 NSTAT=14
     WORD=WORD1
     GO TO 1
C
C     TEST FOR R.LT.1 ANOMALY
C
 020  IF(R-1.) 120,13,13
 120 NSTAT=20
     WORD=WORD4
     GO TO 1
C
C     TEST FOR ZLMT ANOMALY
C
 013 IF (Z - ZLMT) 008, 008, 113
 113 NSTAT=13
     WORD=WORD3
C                                   COMPLETE CX TABLE
 001 MWYA = 3
     WRITE(ISOUT,88) NSTAT,WORD
 008 RETURN
     END
```

```
*DECK,DERIV
      SUBROUTINE DERIV
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     COMPUTES DIFFERENTIALS OF THE CLOUD PROPERTIES IN PREPARATION FOR
C     INTEGRATION OVER A TIME STEP
C
C ***********************************************C********************
C
       COMMON /ATMOS/ NAT, ALT(256),  ATP(256),  PRS(256), RLH(256),
     1          RHO(256), ETA(256), NHODO, ZV(100),  VX(100), VY(100)
      COMMON /CLOUD/ CHANGE,CMLR  ,C2     ,C3     ,C6     ,DEK    ,DRM    ,
     1 DS     ,DST    ,DST0  ,DST1  ,DST2  ,DT     ,DU     ,DWT    ,DX     ,
     2 DZ     ,ED     ,EK    ,EPS   ,ES    ,HLF    ,KS     ,KSV    ,MWYA   ,
     3 N      ,NNN    ,P     ,PW    ,R     ,RA     ,RL     ,RM     ,RZT    ,
     4 S      ,SAVE   ,SHAPE ,SMALLT,T     ,TE     ,U      ,V      ,WT     ,
     5 X      ,XE     ,Z     ,ZBFR  ,ZLMT  ,SPARE
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VPR
C
C ********************************************************************
C
      DZ=U
C
C
C     OBTAIN VALUES OF AMBIENT TEMPERATURE, PRESSURE ,RELATIVE HUMIDITY
C
      CALL TRPL(Z,NAT ,ALT,ATP,TE)
      CALL TRPL(Z,NAT ,ALT,PRS,P)
```

```
      CALL TRPL(Z,NAT ,ALT,RLH,HLR)
C
C
C     COMPUTE AMBIENT AIR WATER MIXING RATIO
C
      XE=109.98*HLR*(TE/273.)**(-5.13)*EXP((25.*(TE-273.))/TE)/(P*29.)
      TAO=0.
C
C     COMPUTE SPECIFIC HEAT OF IN-CLOUC AIR
C
      IF(T-2300.)15,15,16
   15 TPR=T
      CP=946.6+0.1971*T
      GO TO 17
   16 TPR=2300.
      TAO=-3587.5*(T-TPR)+1.0625*(T**2-TPR**2)
      CP=-3587.5+2.125*T
   17 CP=(CP+X*(1697.66+1.144174*T))/(1.+X)
      CPAI=TAO+946.6*(TPR-TE)+0.09855*(TPR**2-TE**2)
C
C     COMPUTE SPECIFIC HEAT OF IN-CLOUC AIR-WATER-SOIL MIXTURE
C
      RMIX=(1.+X)/(1.+X+S+WT)
      CR=CP*RMIX
      IF(THPS-T)380,381,381
  381 IF(T-848.)3810,3810,3811
 3810 CS=781.6+0.5612*T-1.881E7/T**2
      GO TO 3812
 3811 CS=1003.8+0.13510*T
 3812 CR=CR+CS*(S+WT)/(1.+X+S+WT)
  380 QXE=(1.+XE)/(1.+29.*XE/18.)
      QX=(1.+29.*X/18.)/(1.+X)
      QT=T/TE
C
C     COMPUTE HORIZONTAL RADIUS OF CLOUD
C
      R=SQRT(3.*V/(RZT*12.5663706E0))
C
C     IS CLOUD CENTER ALTITUDE GREATER OR LESS THAN ALTITUDE OF PREVIOUS
C     TIME STEP
C        GREATER- TO 1101
C        LESS - TO 1100
      IF(KS.GT.0)GO TO 1102
      IF(Z-ZBFR)1100,1101,1101
 1100 DZ=0.
      U=0.
      DU=0.
      NNN=2
      GO TO 1102
 1101 NNN=1
C
C     COMPUTE CLOUD S TO VOLUME RATIO
C
 1102 SV=12.5663706*R**2/V
C
C     COMPUTE TURBULENT KINETIC ENERGY DISSIPATION RATE
C
      EPS=C3*(2.*EK)**1.5/RZT
      Q7=AMAX1(ABS(U),SQRT(2.*EK))
      QQ=QT*QX*QXE*(1.+X+WT)/(1.+X+S+WT)
```

```
      IF(NHODO)1103,1103,1104
 1103 VS=0.0
      GO TO 1105
C
C     COMPUTE WIND SHEAR CORRECTION FACTOR
C
 1104 ZTP=Z+RZT
      ZBT=Z-RZT
      CALL TRPL(ZTP,NHODO,ZV,VX,VXT)
      CALL TRPL(ZTP,NHODO,ZV,VY,VYT)
      CALL TRPL(ZBT,NHODO,ZV,VX,VXB)
      CALL TRPL(ZBT,NHODO,ZV,VY,VYB)
      VS=SQRT((VXT-VXB)**2 + (VYT-VYB)**2)
 1105 RS=SV*Q7+1.5*C6*VS/R
      GO TO (100,101,100),N
C
C     DRY EQUATIONS
C
C
C     COMPUTE AIR ENTRAINMENT RATE
C
  100 DRM=(RM/(1.-CPAI/(CP*T*QX)))*RMIX*(RS    *RL+(QT*GX*QXE*9.8*U-EPS)*
     1RMIX/(CR*T*QX)-9.8*U/(287./QXE*TE))
      DRME = DRM
C
C     SUBTRACT AWAY RATE OF MASS LOST DUE TO PARTICLES FALLING OUT CLOUD
C     BOTTOM DURING RISE
C
      DRM=DRM-CMLR
C
C     COMPUTE TIME DERIVATIVE OF WATER VAPOR MIXING RATIO
C
      DX=-(1.+X+S)/(1.+XE)*(X-XE)*DRME/RM
C
C     COMPUTE TIME DERIVATIVE OF CLOUD TEMPERATURE
C
      DT=-(RMIX*(QT*QX*QXE*9.8*U-EPS)+CPAI*DRME/RM)/CR
      WT=0.
C
C     NO CHANGE IN LIQUID WATER MIXING RATIO
C
      DWT=0.
      GO TO 555
C
C     WET EQUATIONS
C
  101 Q1=1.+X*29./18.
      IF(T-273.)102,103,103
  102 CL=2.83E6
      GO TO 104
  103 CL=2.5E6
  104 Q2=CL*X/(287.*T)
      Q3=18.*Q2/29./T
      Q4=1.+Q2
      Q5=1.+CL*Q3/CP
      Q6=CL*(X-XE)/CP+T-TE
      Q9=RMIX/Q5
      Q8=Q9/T/QX
C
C     COMPUTE AIR ENTRAINMENT RATE
```

```
C                                                                       DERIV152
      DRM=RMIX*(RM/(1.0-Q6*Q8))*(RS*RL+(QX*QT*9.8*Q4*U*QXE-EPS)/CP/T/QX*DERIV153
     1Q9-(9.8*U)/(287./QXE*TE))                                         DERIV154
      DRME=DRM                                                          DERIV155
C                                                                       DERIV156
C     SUBTRACT AWAY RATE OF MASS LOST DUE TO PARTICLES FALLING OUT CLOUDDERIV157
C     BOTTOM DURING RISE                                                DERIV158
C                                                                       DERIV159
      DRM=DRM-CMLR                                                      DERIV160
C                                                                       DERIV161
C     COMPUTE TIME DERIVATIVE OF TEMPERATURE                            DERIV162
C                                                                       DERIV163
      DT=((-QX*QT*Q4*9.8*U/CP*QXE-Q6*DRME/(RMIX*RM))+EPS/CP)*Q9         DERIV164
C                                                                       DERIV165
C     COMPUTE TIME DERIVATIVE OF WATER VAPOR MIXING RATIO               DERIV166
C                                                                       DERIV167
      DX=Q1*(Q3*DT+9.8*X*U/(287.*TE)*QXE)                               DERIV168
C                                                                       DERIV169
C     COMPUTE TIME DERIVATIVE OF LIQUID WATER MIXING RATIO              DERIV170
C                                                                       DERIV171
      DWT=-(1.+X+S+WT)/RM* (WT+X-XE)/(1.+XE)*DRME-DX                    DERIV172
C                                                                       DERIV173
  555 ED1= 2.*C2*Q7*QQ/RZT                                              DERIV174
      GO TO (621,1110),NNN                                              DERIV175
  621 CONTINUE                                                          DERIV176
C                                                                       DERIV177
C     COMPUTE CLOUD VERTICAL ACCELERATION                               DERIV178
C                                                                       DERIV179
      DU =  9.8 * (QT*QX*QXE*RMIX-1.) - ( ED1 + DRM/RM ) * U            DERIV180
C     COMPUTE EDDY VISCOUS RATE OF LOSS OF KINETIC ENERGY OF RISE       DERIV181
C                                                                       DERIV182
 1110 ED=ED1*U**2                                                       DERIV183
C     COMPUTE TIME DERIVATIVE OF TURBULENT KINETIC ENERGY DENSITY       DERIV184
C                                                                       DERIV185
      DEK=ED-(EK-0.5*U**2)*DRME/RM-EPS                                  DERIV186
C                                                                       DERIV187
C     COMPUTE TIME DERIVATIVE OF SOIL MIXING RATIO                      DERIV188
C                                                                       DERIV189
      DS=-(1.+X+S+WT)*S/RM*(CMLR/(S+WT)+DRME/(1.+XE))                   DERIV190
C                                                                       DERIV191
C     COMPUTE IN-CLOUD GAS DENSITY                                      DERIV192
C                                                                       DERIV193
      PA=RM/V*RMIX                                                      DERIV194
      IF(EPS)902,902,901                                                DERIV195
  902 EPS=1.0E-4                                                        DERIV196
  901 RETURN                                                            DERIV197
      END                                                               DERIV198
```

```
*DECK,RKGILL
      SUBROUTINE RKGILL
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C        INTEGRATES THE CLOUD RISE DIFFERENTIAL EQUATIONS VIA THE
C        RUNGE-KUTTA-GILL METHOD
C
C ***********************************************************************
C
       COMMON /ATMOS/ NAT, ALT(256),  ATP(256),  PRS(256), RLH(256),
     1          RHO(256), ETA(256), NHODO, ZV(100),  VX(100), VY(100)
      COMMON /CLOUD/ CHANGE,CMLR  ,C2     ,C3     ,C6     ,DEK    ,DRM    ,
     1 DS     ,DST    ,DST0   ,DST1   ,DST2   ,DT     ,DU     ,DWT    ,DX     ,
     2 DZ     ,ED     ,EK     ,EPS    ,ES     ,HLR    ,KS     ,KSV    ,MWYA   ,
     3 N      ,NNN    ,P      ,PW     ,R      ,RA     ,RL     ,RM     ,RZT    ,
     4 S      ,SAVE   ,SHAPE  ,SMALLT,T      ,TE     ,U      ,V      ,WT     ,
     5 X      ,XE     ,Z      ,ZBFR   ,ZLMT   ,SPARE
C
      DIMENSION DVBL(8),VBL(8),RKG(8)
C
C ***********************************************************************
C
      H=DST
      KS  =0
      KYCL=1
C
      VBL(1)=WT
      VBL(2)=RM
      VBL(3)=U
      VBL(4)=X
      VBL(5)=T
      VBL(6)=Z
      VBL(7)=EK
      VBL(8)=S
C
   20 CALL DERIV
      IF(ABS(U).LT. 1.E-10) VBL(3)=0.
      DVBL(1)=DWT
      DVBL(2)=DRM
      DVBL(3)=DU
      DVBL(4)=DX
      DVBL(5)=DT
      DVBL(6)=DZ
      DVBL(7)=DEK
      DVBL(8)=DS
C
      KS=KS+1
      GO TO (1,3,5,7),KS
C
    1 DO 2 J=1,8
      VBL(J)=VBL(J)+0.5*H*DVBL(J)
    2 RKG(J)=DVBL(J)
      GO TO 10
    3 DO 4 J=1,8
      VBL(J)=VBL(J)+.29289322*H*(DVBL(J)-RKG(J))
    4 RKG(J)=.58578644*DVBL(J)+.12132034*RKG(J)
      GO TO 10
```

```
    5 DO 6 J=1,8
      VBL(J)=VBL(J)+1.7071068*H*(DVBL(J)-RKG(J))
    6 RKG(J)=3.41421356*DVBL(J)-4.1213203*RKG(J)
      GO TO 10
    7 DO 8 J=1,8
    8 VBL(J)=VBL(J)+.16666667*H*(DVBL(J)-2.*RKG(J))
C
      KYCL=2
   10 WT=VBL(1)
      RM=VBL(2)
      U=VBL(3)
      X=VBL(4)
      T=VBL(5)
      Z=VBL(6)
      EK=VBL(7)
      S=VBL(8)
      CALL TRPL(Z,NAT ,ALT,PRS,PQR)
      V=287.*T*RM*(1.+X)/PQR/(1.+X+S+WT)*(1.0+X*29./18.)/(1.0+X)
      IF( U .GT. 0.0 ) RZT = ( 0.2387324 * V * SHAPE**2 )**0.3333333333
      GO TO(20,30),KYCL
   30 RETURN
      END
```

```
*DECK,RSTR
      SUBROUTINE RSTR
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     RSTR PRESERVES AND/OR RESTORES CRM VARIABLES
C
C ***********************************************************************
C
      COMMON /CLOUD/ CHANGE,CMLR  ,C2    ,C3    ,C6    ,DEK   ,DRM   ,
     1 DS    ,DST   ,DST0  ,DST1  ,DST2  ,DT    ,DU    ,DWT   ,DX    ,
     2 DZ    ,ED    ,EK    ,EPS   ,ES    ,HLF   ,KS    ,KSV   ,MWYA  ,
     3 N     ,NNN   ,P     ,PW    ,R     ,RA    ,RL    ,RM    ,RZT   ,
     4 S     ,SAVE  ,SHAPE ,SMALLT,T     ,TE    ,U     ,V     ,WT    ,
     5 X     ,XE    ,Z     ,ZBFR  ,ZLMT  ,SPARE
      COMMON /PARTCL/ NDSTR,RHOP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)
C
      DIMENSION PY(200), Y(200)
      EQUIVALENCE (Y(1),GDPST(1)), (PY(1),GDPST(401))
C
C ************************************************C**********************
C
      GO TO(1,3),KSV
    1 PEK=EK
      PRM=RM
      PSS=S
      PT=T
      PU=U
      PV=V
      PWT=WT
```

```
      PX=X
      PZ=Z
      PRZT=RZT
      DO 2 NP=1,NDSTR
    2 PY(NP)=Y(NP)
      GO TO 5
C
    3 SMALLT=SMALLT-DST
      DST = DST1
      EK=PEK
      RM=PRM
      S=PSS
      T=PT
      U=PU
      V=PV
      WT=PWT
      X=PX
      Z=PZ
      RZT=PRZT
      DO 4 NP=1,NDSTR
    4 Y(NP)=PY(NP)
      N=3
    5 RETURN
      END
```

```
*DECK,RSXP
      SUBROUTINE RSXP
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ****************************************************C*****************
C
C     AFTER THE DYNAMIC CLOUD RISE HAS BEEN COMPLETED, RSXP PASSES
C     THROUGH THE RISE HISTORY TABLE, CX, TO RESIMULATE THE RISE FOR THE
C     PURPOSE OF DEFINING A DISTRUBUTION IN SPACE ABOVE GZ OF FALLOUT
C     PARCELS THAT ARE TO BE TRANSPORTED DOWNWIND BY SUBSEQUENT MODULES.
C     RESULTS ARE WRITTEN ON TAPE IRISE.
C
C
C     DPST(1,MBT)  TIME
C     DPST(2,MBT)  ALTITUDE OF  PARCEL  CENTER OF MASS
C     DPST(3,MBT)  RADIUS
C     DPST(4,MBT)  PARTICLE DIAMETER MICROMETERS
C     DPST(5,MBT)  MASS OR ACTIVITY FRACTION
C     DPST(6,MBT)  PARCEL THICKNESS
C     DPST(7,MBT)  ALTITUDE OF PARCEL BASE
C     DPST(8,MBT)  PARCEL VOLUME
C
C *********************************** ***********************************
C
       COMMON /ATMOS/ NAT, ALT(256),  ATP(256),  PRS(256), RLH(256),
     1          RHO(256), ETA(256), NHODO, ZW(100),  VX(100), VY(100)
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSOL,SLDTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPART,KDI
      COMMON /INITL/ F, PHI, SSAM, TME, MPG, TMFS, VPR
      COMMON /PARTCL/ NDSTR,RHCP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
```

```
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)
C
      DIMENSION DPST(8,2),DPX(2,50),VISCX(50),PPST(8,10),DNWAF(2)
C
  444 FORMAT(*1*/10X,*DEPOSIT INCREMENTS*//15X,*TIME*,7X,*ALT*,8X,*RAD*,
     17X,*DIAM*,8X,*MASS*,8X,*DZ*,7X,*ZLOW*,7X,*VOL*//)
  666 FORMAT(1X,1PE11.3,7E11.3,I2,5X,I2,*IN CLOUD*)
  777 FORMAT(1X,1PE11.3,7E11.3,I2,5X,I2)
  888 FORMAT(1X,1PE11.3,7E11.3/1X,*SUBDIVISION*,2X,I5,5X,*SIZE CLASS*,2X
     1,I5/)
C
C ***********************************************************************
C
C     INITIALIZE WAFER UP-DRIFT INTERPOLATION ARRAYS AND WAFER DATA
C     ARRAYS
C
      DO 2 KA=1,50
      DO 2 KB=1,2
    2 DPX(KB,KA)=0.0
      DO 3 KC=1,8
      DO 3 KQ=1,2
    3 DPST(KC,KQ)=0.0
    4 KDPST=KDI
      DPSTK=KDPST
C
C     COMPUTE WAFER UP-DRIFT INTERPOLATION ARRAYS
C
    6 DO 7 KD=1,MCX
      IF(CX(KD,7)-CX(KD,6))53,53,54
   53 DPX(1,KD)=0.0
      GO TO 55
   54 DPX(1,KD)=(CX(KD,7)-CX(KD,6))/(CX(KD,4)-CX(KD,3))
   55 IF(CX(KD,6))56,56,57
   56 DPX(2,KD)=0.0
      GO TO 7
   57 DENOM=CX(KD,3)-ZBRSTZ
      IF(DENOM)58,56,58
   58 DPX(2,KD)=CX(KD,6)/DENOM
    7 CONTINUE
      IF(IC(6) .GT. 0) WRITE(ISOUT,444)
C
C     SET NOMINAL WAFER EDGE LENGTH IF WAFER RADII ARE TO BE SUBDIVIDED
C
      IF(IRAD)78,78,79
   78 BZ=0.
      GO TO 77
   79 BZ=CX(MCX,5)/FLOAT(IRAD)
C     INITIALIZE TAPE IRISE
   77 REWIND IRISE
 7882 BZ2=BZ/2.0
  120 LODD=0
C
C     COMPUTE IN-CLOUD AIR VISCOSITIES
C
      DO 6045 J=1,MCX
 6045 VISCX(J)=1.458E-6*CX(J,9)**1.5/(110.4+CX(J,9))
      KCX=MCX-1
C
C     COMPUTE A SETTLING RATE THRESHOLD, SRTHS.  SETTLING  RATES LESS
C     THAN THIS VALUE ARE CONSIDERED INSIGNIFICANT AND ARE REPLACED
```

```
C      WITH ZERO.
C
       SRTHS = 0.1 * ( CX( MCX,4 ) - CX( MCX,3 ))/DPSTK/600.
C
C      ENTER OUTSIDE WAFER CALCULATION LOOP.  THIS LOOP DEFINES PARTICLE
C      SIZE CLASSES.
C
   200 DO 278 MA=1,NDSTR
       KDPS=2*KDPST
C
C
C      ENTER MIDDLE WAFER CALCULATION LOOP.  THIS LOOP DEFINES CLOUD
C      WAFER SUBDIVISIONS.
C
       DO 258 MB=1,KDPS
C
C      COMPUTE WAFER TOP OR BOTTOM INDICATOR, MBT
C          IF MB IS ODD, MBT=2        THIS SPECIFIES A WAFER BOTTOM
C          IF MB IS EVEN, MBT=1       THIS SPECIFIES A WAFER TOP
C
       MBT=2*((MB+1)/2)-MB+1
C
C      INITIAL DPST VARIABLES
C
       DPST(1,MBT)=CX(1,1)
       DPST(3,MBT)=CX(MCX,5)
       GO TO (202,201),MBT
   201 DPST(4,MBT)=DIAM(MA)
       GO TO 203
   202 DPST(4,MBT)=DIAM(MA+1)
   203 DPST(5,MBT)=FMASS(MA)/DPSTK
       IF(SD .GT. 0.0)DPST(5,MBT)=DPST(5,MBT)*SSAM
       BM=MB/2
       DPST(2 ,MBT)=CX(1,3)+(CX(1,4)-CX(1,3))/KDI*BM
       ZLST=DPST(2,MBT)
       KBASE=1
       JBASE=1
C
C      ENTER INSIDE WAFER CALCULATION LOOP. THIS LOOP DEFINES CLOUD
C      RISE HISTORY TIMES IN THE CX ARRAY
C
C
C      COMPUTE DPST TRAVEL
C
       DO 238 MC=1,KCX
       ZVSB=DPST( 2,MBT)-CX(MC,3)
       IF( ABS( ZVSB ) .LT.   .1 ) ZVSB = 0.0
       IF(ZVSB)204,210,210
   204 GO TO (206,208),KBASE
C
C      ADJUST DPST RADIUS AND ALTITUDE FOR LEAVING CLOUD
C
   206 KBASE=2
       MD=MC-1
   207 EXTM=(ZLST-CX(MD,3))/(CX(MD,6)-UP+DN)
  1207 DPST(3,MBT)=CX(MD,5)+EXTM*CX(MD,8)
       DPST( 2,MBT)=ZLST+(UP-DN)*EXTM
C
C      IF THE WAFER IS ON THE GROUND, JUMP THE INNER LOOP.  IF NOT,
C      COMPUTE THE POSITION OF THE WAFER BELOW THE CLOUD BASE.
```

```
C
      GO TO (1208,233),JBASE
 1208 DPST( 2,MBT)=DPST( 2,MBT)+(CX(MD,6)-DN)*(CX(MD,2)-EXTM)
C
C     COMPUTE BELOW CLOUD AIR DENSITY , VISCOSITY AND TEMPERATURE
C
  208 UP=CX(MC,6)+ZVSB*DPX(2,MC)
      CALL TRPL(DPST( 2,MBT),NAT ,ALT,RHO,DEN)
      CALL TRPL(DPST( 2,MBT),NAT ,ALT,ETA,VIS)
      CALL TRPL(DPST( 2,MBT),NAT ,ALT,ATP,TMP)
      GO TO 212
C
C     COMPUTE INSIDE CLOUD GAS DENSITY, VISCOSITY AND TEMPERATURE
C
  210 UP=CX(MC,6)+ZVSB*DPX(1,MC)
      FC=(DPST(1,MBT)-CX(MC,1))/(CX(MC+1,1)-CX(MC,1))
      DEN=CX(MC,10)+(CX(MC+1,10)-CX(MC,10))*FC
      VIS=VISCX(MC)+(VISCX(MC+1)-VISCX(MC))*FC
      TMP=CX( MC,9)+(CX( MC+1,9)-CX( MC,9))*FC
C
C     COMPUTE FALL SPEEDS
C
  212 CALL TRPL(DPST( 2,MBT),NAT ,ALT,PRS,P)
      CALL SETTLE(DPST(4,MBT),RHOP,DEN,VIS,TMP,P,DN,IACCR)
      IF( DN .LT. SRTHS ) DN = 0.0
      ZNXT=DPST( 2,MBT)+CX(MC,2)*(UP-DN)
C
C     HAS THE PARTICLE REACHED THE GROUND-
C         YES TO 220
C        NO TO 230
C
      IF(ZNXT-ZBRSTZ)220,220,230
C
C     COMPUTE DPST TIME OF ARRIVAL ON FALLOUT FIELD
C
  220 EXTM=(ZBRSTZ-DPST( 2,MBT))/(UP-DN)
      DPST(1,MBT)=DPST(1,MBT)+EXTM
      DPST( 2,MBT)=ZBRSTZ
      DNWAF(MBT)=DN
      JBASE=2
      MD=MC
      GO TO (1207,233),KBASE
  230 DPST(1,MBT)=DPST(1,MBT)+CX(MC,2)
      ZLST=DPST(2,MBT)
      DPST(2,MBT)=ZNXT
  238 CONTINUE
  233 GO TO (241,2440),MBT
C
C     IF BOTH TOP AND BOTTOM HAVE BEEN TREATED, ARE THE TOP AND BOTTOM
C     RADII THE SAME---
C         YES TO 5448
C         NO TO 2401
C
  241 IF(ABS(DPST(3,1) - DPST(3,2)) .GT. 0.1) GO TO 2441
 2440 IFLAG=1
      GO TO (240,258),MBT
  240 IF( IC(6) .EQ. 1)
     1             WRITE(ISOUT,777)(DPST(I,MBT),I=1,8),MBT,IFLAG
      GO TO 5442
 2441 IFLAG=2
```

```
      IF(IC(6))2401,2401,2351
 2351 WRITE(ISOUT,777)(DFST(I,MBT),I=1,8),MBT,IFLAG
 2401 IF(DPST(2,2)-ZBRSTZ)259,259,2448
C
C     ADJUST WAFER ALTITUDES IF THEY ARE IMPACTED
C
  259 DPST(2,2)= DPST(2,2) - (CX(MCX,1) - DPST(1,2))*DNWAF(2)
      IF(DPST(2,1) - ZBRSTZ)6020,6020,2448
 6020 DPST(2,1)= DPST(2,1) - (CX(MCX,1) - DPST(1,1))*DNWAF(1)
C     DETERMINE PARAMETERS TO BE USED TO SUBDIVIDE A WAFER WHOSE TOP
C     AND BOTTOM HAVE DIFFERENT RADII
C
 2448 AL=DPST(3,1)/DPST(3,2)
      RB=3.1415927*DPST(3,2)**2
      KDIP=AL
      IF(KDIP-10)2442,2442,2443
 2443 KDIP=10
      GO TO 2444
 2442 IF(KDIP-2)2450,2444,2444
 2450 IF(AL-1.5)2451,2452,2452
 2451 KDIP=1
      GO TO 2444
 2452 KDIP=2
 2444 ZD=DPST(2,1)-DPST(2,2)
      FK=FLOAT(KDIP)
      DZ=ZD/FK
      ALL=0.5*ZD/ALOG(AL)
C
C     SPECIFY PPST ARRAYS FOR THE WAFER SUBDIVISIONS
C
      DO 2445 I=1,KDIP
      FI=FLOAT(I)
      A=DPST(2,2)+(FI-1.)*DZ
      B=A+DZ
      A1=AL**(2.0*(B-DPST(2,2))/ZD)
      A2=AL**(2.0*(A-DPST(2,2))/ZD)
      PPST(2,I)=ALL*(ALOG(0.5*(A1+A2)))+DPST(2,2)
      PPST(3,I)=DPST(3,2)*(AL**((PPST(2,I)-DPST(2,2))/ZD))
      PPST(1,I)=DPST(1,MBT)
      PPST(4,I)=SQRT(DPST(4,1)*DPST(4,2))
      PPST(5,I)=DPST(5,MBT)/FK
      PPST(6,I)=DZ
      PPST(7,I)=A
      PPST(8,I)=RB*ALL*(A1-A2)
C
C     ADJUST PPST ARRAY VALUES FOR AN IMPACTED PARCEL
C
      IF(PPST(2,I).GT.ZBRSTZ) GO TO 3443
      PPST(1,I) = CX(MCX,1) - (ZBRSTZ - PPST(2,I))/(DNWAF(2) +
     1 (DNWAF(1) - DNWAF(2))*(PPST(2,I) - DPST(2,2))/ZD)
      PPST(2,I)=ZBRSTZ
      PPST(6,I)=0.0
      PPST(7,I)=ZBRSTZ
      PPST(8,I)=0.0
      GO TO 2445
 3443 IF(PPST(7,I) .GT. ZBRSTZ) GO TO 2445
      PPST(6,I)=PPST(6,I) - ZBRSTZ + PPST(7,I)
      PPST(8,I)= PPST(8,I) - 3.1415927*(ZBRSTZ- PPST(7.I))*PPST(3,I)**2
      PPST(7,I)=ZBRSTZ
 2445 CONTINUE
```

```
 5443 IP=0
 5445 IP=IP+1
C
C     SET UP THE DPST ARRAY FOR A WAFER SUBDIVISION FROM THE PPST ARRAY
C
      DO 5444 J=1,8
 5444 DPST(J,MBT)=PPST(J,IP)
 5442 GO TO (5448,5447),IFLAG
C
C     SPECIFY FINAL DPST ARRAY FOR A WAFER WITH EQUAL BASE AND TOP RADII
C
 5448 DPST(6,MBT)= DPST(2,1)-DPST(2,2)
      DPST(2,MBT)=(DPST(2,1)+DPST(2,2))*0.5
      DPST(4,MBT)=SQRT(DPST(4,1)*DPST(4,2))
      DPST(7,MBT)=DPST(2,2)
      DPST(8,MBT)=DPST(6,MBT)*3.1415927*DPST(3,1)**2
      IF(IC(6))5447,5447,5826
 5826 WRITE(ISOUT,666)(DPST(I,MBT),I=1,8),MBT,IFLAG
 5447 IF(IRAD)5022,5022,783
C
C
C     INITIALIZE FOR HORIZONTAL WAFER SUBDIVISION
C
  783 XR=BZ2
      YR=BZ2
 5060 RADIUS=DPST(3,MBT)
      RAD2=RADIUS**2
 5010 IF(RAD2-2.0*BZ2**2)5022,1004,1004
C
C
C
C     SPECIFY GDPST ARRAY FOR WAFERS THAT ARE NOT TO BE SUBDIVIDED
C     HORIZONTALLY
C
 5022 LODD=LODD+1
      GDPST(6,LODD)=DPST(2,MBT)
      GDPST(4,LODD)=DPST(4,MBT)
      GDPST(3,LODD)=DPST( 1,MBT)
      GDPST(5,LODD)=DPST(5,MBT)
      GDPST(1,LODD)=0.
      GDPST(2,LODD)=0.
      GDPST(7,LODD)=DPST(3,MBT)
      GDPST(8,LODD)=DPST(6,MBT)
      GDPST(9,LODD)=DPST(7,MBT)
      GDPST(10,LODD)=DPST(8,MBT)
      GO TO 5030
 1003 IF((XR)**2+(YR)**2-RAD2)1001,1001,1002
C
C     SUBDIVIDE WAFERS HORIZONTALLY AND SPECIFY THE GDPST ARRAY DATA
C
C
C      COUNT THE TOTAL NUMBER OF HORIZONTAL SUBDIVISIONS
C
 1004 EX=BZ2
      EY=BZ2
      CNT=4.0
 7210 EX=EX+BZ
      IF(EX**2+EY**2-RAD2)7201,7201,7202
 7201 CNT=CNT+4.0
      GO TO 7210
```

```
 7202 EX=BZ2
      EY=EY+BZ
      IF(EX**2+EY**2-RAD2)7201,7201,7203
 7203 CMA=DPST(5,MBT)/CNT
 1001 LODD=LODD+1
      LL=LODD+3
      DO 1050 J=LODD,LL
      GDPST(9,J)=DPST(7,MBT)
      GDPST(10,J)=DPST(8,MBT)/CNT
      GDPST(7,J)=BZ2
      GDPST(8,J)=DPST(6,MBT)
      GDPST(6,J)=DPST(2,MBT)
      GDPST(4,J)=DPST(4,MBT)
      GDPST(3,J)=DPST(1,MBT)
 1050 GDPST(5,J)=CMA
      GDPST(1,LODD)=XR
      GDPST(2,LODD)=YR
      LODD=LODD+1
      GDPST(1,LODD)=XR
      GDPST(2,LODD)=-YR
      LODD=LODD+1
      GDPST(1,LODD)=-XR
      GDPST(2,LODD)=-YR
      LODD=LODD+1
      GDPST(1,LODD)=-XR
      GDPST(2,LODD)=YR
 5030 IF(LODD- 97)1100,1010,1010
 1100 IF(IRAD)2585,2585,1101
 1101 XR=XR+BZ
      GO TO 1003
 1002 YR=YR+BZ
      XR=BZ2
      IF(YR-RADIUS)1003,1003,2585
C
C     LOAD THE GDPST ARRAYS ON THE CRM OUTPUT TAPE
C
 1010 WRITE(IRISE)LODD
      WRITE(IRISE)(GDPST(1,J),GDPST(2,J),GDPST(3,J),GDPST(4,J),GDPST(5,J
     1),GDPST(6,J),GDPST(7,J),GDPST(8,J),GDPST(9,J),GDPST(10,J),J=1,LODD
     2)
      LODD=0
      GO TO 1100
 2585 GO TO (258 ,2586),IFLAG
 2586 IF(IP-KDIP)5445,258,258
  258 CONTINUE
  278 CONTINUE
C
C     LOAD FINAL RESIDUE OF GDPST DATA ON THE CRM OUTPUT TAPE
C
 1030 WRITE(IRISE)LODD
      WRITE(IRISE)(GDPST(1,J),GDPST(2,J),GDPST(3,J),GDPST(4,J),GDPST(5,J
     1),GDPST(6,J),GDPST(7,J),GDPST(8,J),GDPST(9,J),GDPST(10,J),J=1,LODD
     2)
      LODD=0
      WRITE(IRISE)LODD
      END FILE IRISE
      REWIND IRISE
      RETURN
      END
```

```
*DECK,WNDSFT
      SUBROUTINE WNDSFT
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ****************************************************************************
C
C     THIS PROGRAM READS A TAPE ( IRISE) OF DATA WHICH DESCRIBES AN
C     AXIALLY SYMMETRIC STABILIZED CLOUD OF FALLOUT PARCELS
C     AND TRANSLATES THE HORIZONTAL COORDINATES OF EACH PARCEL
C     TO ACCOUNT FOR WIND DRIFT DURING THE CLOUD RISE TIME INTERVAL.
C     IT ALSO APPLIES A TRANSLATION OF GZ COORDINATES AND TIME.
C     RESULT IS WRITTEN ONTO TAPE JPARN FOR USE BY THE TRANSPORT MODULE.
C
C ***********************  GLOSSARY  ***********************************
C
C     DWAF(I)    PARCEL VERTICAL DIMENSION (M)
C     DX         WIND-SHIFT CORRECTION TO BE ADDED TO THE PARCEL X
C                COORDINATE
C     DY         WIND-SHIFT CORRECTION TO BE ADDED TO THE PARCEL Y
C                COORDINATE
C     FV         STILL AIR PARTICLE SETTLING RATE
C     IRROR      NUMBER OF STATEMENT NEAR WHERE AN ERROR WAS DISCOVERED
C     PMAS(I)    TOTAL PARTICULATE MASS (KGM) OF PARCEL
C     RV         UPWARD COMPONENT OF VELOCITY OF A STEM PARCEL
C     RWAF(I)    RADIUS (METERS) OF PARCEL AT CENTER OF MASS
C     TC(I)      TIME(RELATIVE TO DETONATION OF)THE I-TH CLOUD RISE
C                TABLE ENTRY
C     TCUR       PARCEL   TIME COORDINATE DURING A WIND DRIFT
C                ADJUSTMENT CALCULATION INCREMENT
C     TP(I)      TIME OF DEFINITION (SEC) OF THE I TH PARCEL
C     VB(I)      CLOUD  BASE  VEL.  OF THE I-TH CLOUD RISE TABLE ENTRY
C     VC(I)      VELOCITY ASSOCIATED WITH CLOUD AT ZC(I) AT TC(I).
C     VT(I)      CLOUD TOP VELOCITY OF THE I-TH CLOUD RISE TABLE ENTRY
C     VWAF(I)    PARCEL VOLUME (M**3)
C     XC(I)      X COORDINATE OF THE CLOUD CAP CENTER FOR THE ITH CLOUD
C                RISE TABLE ENTRY AFTER WIND SHIFT ADJUSTMENT
C     XPAR(I)    ADJUSTED X COORDINATE OF PARCEL (M)
C     YC(I)      Y COORDINATE OF THE CLOUD CAP CENTER FOR THE ITH CLOUD
C                RISE TABLE ENTRY AFTER WIND SHIFT ADJUSTMENT
C     YPAR(I)    ADJUSTED Y COORDINATE OF PARCEL (M)
C     ZB(I)      CLOUD  BASE  ALT.  OF THE I-TH CLOUD RISE TABLE ENTRY
C                (METERS ABOVE MSL)
C     ZC(I)      CLOUD CENTER ALT.  OF THE I-TH CLOUD RISE TABLE ENTRY
C                (METERS ABOVE MSL)
C     ZCUR       PARCEL   ALTITUDE AT THE BEGINNING OF A WIND DRIFT
C                ADJUSTMENT CALCULATION INCREMENT
C     ZLOW(I)    ALTITUDE OF PARCEL BASE (M)
C     ZPAR(I)    Z COORDINATE OF PARCEL (M ABOVE MSL)
C     ZT(I)      CLOUD TOP ALTITUDE OF THE I-TH CLOUD RISE TABLE ENTRY
C                (METERS ABOVE MSL)
C
C ****************************************************************************
C
       COMMON /ATMOS/ NAT, ALT(256),  ATP(256),  PRS(256), RLH(256),
     1          RHO(256), ETA(256), .4000, ZV(100),  VX(100), VY(100)
      COMMON /BASIC/ W,FW,ZBRSTZ,HEIGHT,ZSCL,SLOTMP,TMSD,XGZ,YGZ,TGZ
      COMMON /CONTRL/ DETID(12),IC(20),IRAD,IRISE,ISIN,ISOUT,JPARN,KUI
      COMMON /INITL/ F, PHI, SSAM, TME, TMPG, TMPS, VFR
      COMMON /PARTCL/ NDSTR,RHCP,DMEAN,SD,PS(200),DIAM(201),FMASS(200)
```

```
      COMMON /TABLES/ MCX, CX(50,10), GDPST(10,100)
C
      DIMENSION        TC(50), XC(50), YC(50), ZC(50),  VC(50),   ZT(50),
     1  ZB(50),  VB(50),  VT(50), XPAR(100), YPAR(100), TP(100),
     2  PSIZ(100),  PMAS(100),  ZPAR(100), RWAF(100), DWAF(100),
     3  ZLOW(100), VWAF(100)
C
      EQUIVALENCE (TC(1),CX(1,1)),(ZT(1),CX(1,4)),(ZB(1),CX(1,3)),
     1  (VB(1),CX(1,6)),(VT(1),CX(1,7)), (XPAR(1),GDPST(1)), (YPAR(1),
     2  GDPST(101)), (TP(1),GDPST(201)), (PSIZ(1),GDPST(301)),
     3   (PMAS(1),GDPST(401)), (ZPAR(1),GDPST(501)), (RWAF(1),GDPST(601)
     4), (DWAF(1),GDPST(701)), (ZLOW(1),GDPST(801)),(VWAF(1),GDPST(901))
     5,(XC(1),CX(1,2)),(YC(1),CX(1,8)),(ZC(1),CX(1,9)),(VC(1),CX(1,10))
      DATA PROGRM/6HWNDSFT/
C
    1 FORMAT(1X,A6,I3,4E12.5,I5)
 6022 FORMAT(1H124X,16HCLOUD TRAJECTORY/6X,2HXC,12X,2HYC,12X,2HZC,12X,2H
     1TC,12X,2HVC)
    2 FORMAT(5(1X,E13.6))
    4 FORMAT(1X,I5)
 3013 FORMAT( ///
     1         10X,14HBLOCK COUNT = I5// )
 1012 FORMAT(1X,*PARTICLE BLOCK BEFORE SHIFT*,/8X,*X*,11X,*Y*,11X,*T*,9X
     1,*PSIZ*,9X,*PMAS*,10X,*Z*,9X,*RWAF*,8X,*DWAF*,8X,*ZLOW*,8X,*VWAF*,
     2//(1X,10E12.5))
    3 FORMAT(1X,*PARTICLE BLOCK AFTER SHIFT *,/8X,*X*,11X,*Y*,11X,*T*,9X
     1,*PSIZ*,9X,*PMAS*,10X,*Z*,9X,*RWAF*,8X,*DWAF*,8X,*ZLOW*,8X,*VWAF*,
     2//(1X,10E12.5))
C
C ***********************************************************************
C
      IF(NHODO)100,100,200
  100 IRROR=-100
      CALL ERROR(PROGRM,IRROR,ISOUT)
C
C     INITIALIZE TAPES
  200 REWIND IRISE
      REWIND JPARN
      WRITE(JPARN)FW,SSAM,SLDTMP,TMSD,SD,W,HEIGHT,RHOP,CX(MCX,5),ZBRSTZ
      WRITE(JPARN)XGZ,YGZ,TGZ
      WRITE(JPARN)(DETID(I),I=1,12)
      WRITE(JPARN)NDSTR
      WRITE(JPARN)(PS(J),DIAM(J),FMASS(J),J=1,NDSTR)
      WRITE(JPARN)NAT
      WRITE(JPARN)(ALT(J),ATP(J),PRS(J),RLH(J),RHO(J),ETA(J),J=1,NAT)
C
C     COMPUTE CLOUD CENTER  AND STEM DRIFT FACTOR ENTRIES IN RISE TABLE
C
   10 CONTINUE
      DO 25 I=1,MCX
      ZC(I) = (ZB(I)+ZT(I))/2.0
      VC(I)=(VB(I)+VT(I))/2.0
 25   CONTINUE
      MCXP1 = MCX + 1
      MHODO=NHODO-1
C
C     ENSURE THAT WIND VECTORS ARE DEFINED TO ABOVE
C     STABLIZED CLOUD BOTTOM ALTITUDE
C
      IF ((ZV(NHODO)+ZV(MHODO))/2.0 .GE. ZB( MCX ))   GO TO 2217
```

```
   26 IRROR=-26
      GO TO 7734
C
C     FIND HODOGRAPH VECTOR ALTITUDE APPROPRIATE FOR INITIAL TIME
 2217 J=1
      K=1
 28   IF(ZC(1)-(ZV (J+1)+ZV(J))/2.0)   35,35,30
 30   IF(J-NHODO)  31,32,32
 31   J=J+1
      GO TO 28
 32   IRROR = -32
      GO TO 7734
C
C     COMPUTE HORIZONTAL DISPLACEMENTS VS. TIME FOR THE CLOUD BOTTOM
C     CENTER.
 35   XT=TC(1)*VX(J)
      YT=TC(1)*VY(J)
      XC(1)=XT
      YC(1)=YT
      TTEMP=TC(1)
      ZTEMP=ZC(1)
C
C 122 WHICH IS LOWER, NEXT CLOUD POSIT OR NEXT HODOGRAPH VECTOR
C
  122 IF(J.GE.NHODO) GO TO 124
      IF((ZV(J+1) + ZV(J))/2. -ZC(K+1))123,124,124
  123 DELT=((ZV(J+1)+ ZV(J))/2.- ZTEMP)/VC(K)
      ZTEMP= (ZV(J+1)+ZV(J))/2.
      TTEMP=TTEMP+DELT
      XT=XT+       VX(J)*DELT
      YT=YT+       VY(J)*DELT
      J=J+1
      GO TO 122
C
C     NEXT CLOUD CELL CENTER IS LOWER
  124 DELT=TC(K+1)-TTEMP
      TTEMP=TC(K+1)
      ZTEMP=ZC(K+1)
      XC(K+1)=XT+VX(J)*DELT
      YC(K+1)=YT+VY(J)*DELT
      XT=XC(K+1)
      YT=YC(K+1)
      K=K+1
      IF(K- MCX ) 122,125,125
C
C 125 CLOUD TRAJECTORY IS COMPLETE
  125 WRITE(ISOUT,6022)
      WRITE (ISOUT,2)(XC(J),YC(J),ZC(J),TC(J),VC(J),J=1,MCX)
C
  104 READ(IRISE)N
      IF(N)102,102,103
C
C 102 FINAL EXIT.   ALL DATA HAVE BEEN MODIFIED.  MARK JPARIN COMPLETED.
 102  N=0
      IF(IC(7))2013,2014,2013
 2013 WRITE(ISOUT,3013)N
 2014 WRITE(JPARN )N
      END FILE JPARN
      REWIND JPARN
      REWIND IRISE
```

```
      RETURN
 7734 CALL ERROR(PROGRM,IRROR,ISOUT)
      RETURN
C
C 103 READ A BLOCK OF N PARTICLE DESCRIPTIONS
  103 READ(IRISE )(XPAR(J),YPAR(J),TP(J),PSIZ(J),PMAS(J),ZPAR(J),RWAF(J)
     1,DWAF(J),ZLOW(J),VWAF(J),J=1,N)
      IF(IC(7))2015,2010,2015
 2015 WRITE(ISOUT,3013)N
      WRITE(ISOUT,1012)(XPAR(I),YPAR(I),TP(I),PSIZ(I),PMAS(I),ZPAR(I),
     1RWAF(I),DWAF(I),ZLOW(I),VWAF(I),I=1,N)
C
C     NOW PREPARE TO SHIFT PARTICLES HORIZONTALLY IN ACCORDANCE WITH THE
C     POSITION OF THE CLOUD AT THE TIME WHEN THE PARTICLE LEFT THE CLOUD
C
C        FIRST INITIALIZE FOR ENTERING A LOOP ON PARTICLES
 2010 OLDZ=-99999.0
      OLDPS=-1.0
      OLDT=-1.0
      J=1
C 105 WAS THE CURRENT (J-TH) PARTICLE DEFINED AT THE SAME TIME AS THE
C     PREVIOUS ONE.   YES TO 1051
  105 IF(TP(J)-OLDT)106,1051,106
C
C1051 IS THE CURRENT (J-TH) PARTICLE THE SAME SIZE AS THE PREVIOUS ONE.
C     YES TO 107
 1051 IF(PSIZ(J)-OLDPS)106,107,106
C
C 107 IS THE J-TH PARTICLE AT THE SAME ALTITUDE AS THE PREVIOUS ONE.
C     YES TO 108
  107 IF(ZPAR(J)-OLDZ)106,108,106
C
C 108 THE PARTICLE WILL HAVE THE SAME HORIZONTAL DISPLACEMENTS AS THE
C     PREVIOUS ONE AND WILL LEAVE THE CLOUD AT THE SAME TIME AND ALTI-
C     TUDE AS THE PREVIOUS ONE. ADDITION OF XGZ,YGZ MAKES XPAR, YPAR
C     RELATIVE TO COORDINATE SYSTEM ORIGIN
  108 TP(J)=TP(J)+TGZ
  109 XPAR(J)=XPAR(J)+DX+XGZ
      YPAR(J)=YPAR(J)+DY+YGZ
C
C     INCREMENT AND TEST J TO CONSIDER THE NEXT PARTICLE OR RETURN TO
C     FETCH THE NEXT BLOCK OF PARTICLE DATA.
      J=J+1
      IF(J-N)105,105,110
C
C 110 PUT THE MODIFIED DATA ON THE TAPE JPAPIN AND THEN RETURN TO
C     FETCH THE NEXT DATA BLOCK.
  110 WRITE(JPARN )N
      WRITE (JPARN )(XPAR(J),YPAR(J),ZPAR(J),TP(J),PSIZ(J),PMAS(J),RWAF
     1(J),DWAF(J),ZLOW(J),VWAF(J),J=1,N)
      IF(IC(7))185,104,185
  185 WRITE (ISOUT,4)N
      WRITE(ISOUT,3)(XPAR(I),YPAR(I),TP(I),PSIZ(I),PMAS(I),ZPAR(I),
     1RWAF(I),DWAF(I),ZLOW(I),VWAF(I),I=1,N)
  190 GO TO 104
  106 OLDPS=PSIZ(J)
      OLDZ=ZPAR(J)
      OLDT=TP(J)
C
C     DID J-TH PARTICLE LEAVE THE CLOUD.   NO TO 115
```

```
      IF(ZPAR(J)-ZB( MCX )) 114,115,115
C
C 115 TAKE CARE OF PARTICLES THAT DONT LEAVE THE CLOUD
 115  DX=XC(MCX)
      DY=YC(MCX)
C     TP(J) AND ZPAR(J) ARE OK AS IS.
      GO TO 108
C
C 114 THE PARTICLE HAS LEFT THE CLOUD
C
  114 ZCUR=ZPAR(J)
      IF( ZCUR .LT. ZBRSTZ ) ZCUR=ZBRSTZ
      TCUR=TP(J)
      DX=0.
      DY=0.
C     COMPUTE ATMOSPHERE PROPERTIES AT ZCUR
      CALL TRPL(ZCUR,NAT,ALT,ATP,T)
      CALL TRPL(ZCUR,NAT,ALT,PRS,P)
      CALL TRPL(ZCUR,NAT,ALT,RHO,DEN)
      CALL TRPL(ZCUR,NAT,ALT,ETA,VIS)
C
C     LOCATE PARTICLE DEFINITION TIME IN THE CLOUD RISE TABLE.
C
      DO 210 K=1,MCX
      LL=MCXP1-K
      IF(TC(LL).LE.TP(J)) GO TO 221
  210 CONTINUE
  211 IRROR=-211
      GO TO 7734
C
C 221 LOCATE INITIAL PARTICLE ALTITUDE IN THE WIND HODOGRAPH TABLE
C
  221 DO 230 K=1,MHODO
      IF((ZV(K)+ZV(K+1))/2.0.GT.ZPAR(J))GO TO 240
  230 CONTINUE
      MM=NHODO
      GO TO 220
  240 MM=K
C
C 220 FIND CLOUD BOTTOM ALTITUDE AT THE PARTICLE DEFINITION TIME
  220 ZBOTOM= ZB(LL) +(TP(J)-TC(LL))*VB(LL)
      IF((ZBOTOM- ZCUR).LE.115.*W**(0.151)) GO TO 225
C
C     LOCATE INITIAL PARTICLE ALTITUDE IN THE CLOUD RISE HISTORY TABLE
C
      DO 222 K=1,MCX
      NN=MCXP1-K
      IF(ZB(NN).LE.ZCUR) GO TO 224
  222 CONTINUE
C
C     COMPUTE AN AVERAGE BASE RATE, BV
C
  224 IF(LL.GT.NN)GO TO 3224
      BV=VB(LL)
      GO TO 3227
 3224 BV=0.
      DO 3225 K=NN,LL
      IF(K.EQ.  MCX  ) GO TO 3226
 3225 BV=BV +VB(K)*(TC(K+1)- TC(K))
 3226 BV= BV/(TC(LL)-TC(NN))
```

```
 3227 CALL SETTLE(PSIZ(J),RHOP,DEN,VIS,T,P,FV,IACCR)
C
C     CAN THE PARTICLE BE MOVEC SIGNIFICANTLY IN THE TIME AVAILABLE----
C            YES TO 250
C            NO TO 315
C
      IF(( ZBOTOM-ZCUR+10.0).LT.(TP(J)-TC(1))*(FV+BV)) GO TO 250
  225 DELTEE=0.
      GO TO 315
C
C    INDEX  MM IDENTIFIES THE WIND HODOGRAPH STRATUM IN WHICH THE
C     PARTICLE IS CURRENTLY DEFINED.
C
C     INDEX LL   IDENTFIES THE CLOUD RISE HISTORY TABLE ENTRY WHICH
C     REPRESENTS THE RISE INCREMENT DURNING WHICH THE PARTICLE IS
C     CURRENTLY DEFINED.
C
C 245 LOCATE CURRENT PARTICLE ALTITUDE IN THE WIND HODOGRAPH TABLE
C
  245 DO 246 K=1,MHODO
      IF((ZV(K) +ZV(K+1))/2.0 .GT. (ZCUR+ 1.0))GO TO 247
  246 CONTINUE
      MM=NHODO
      GO TO 250
  247 MM=K
C
  250 CONTINUE
C
C     DETERMINE IF NET PARTICLE MOTION IS UPWARD OR DOWNWARD.
C                     UPWARC TO 251
      CALL SETTLE(PSIZ(J),RHOP,DEN,VIS,T,P,FV,IACCR)
C
C                    DOWNWARC TO 253
C
      IF((ZBOTOM-ZBRSTZ) .GT.0.0) GO TO 2298
 2297 RV=0.
      GO TO 2299
 2298 RV=VB(LL)*( 1.0+( ZCUR-ZBOTOM)/( ZBOTOM-ZBRSTZ))
      IF( ABS(RV) .GT. ABS(VB(LL)) ) RV=VB(LL)
 2299 IF(FV-RV .GE.0.0)GO TO 253
C
C 251 COMPUTE THE TIMES REQUIRED FOR THE PARTICLE TO MOVE TO THE
C     BOTTOM OF THE HODOGRAPH STRATUM IN WHICH IT RESIDES,AND TO THE
C     BASE OF THE CLOUC.  USE THE SMALLER OF THESE TIMES.
C
  251 IF((MM-1).GT.0) GO TO 252
      DELZEE= ZBRSTZ-ZCUR
      GO TO 1253
  252 DELZEE= (ZV(MM) +ZV(MM-1))/ 2.0-ZCUR
      IF(DELZEE .LT. -0.01)GO TO 1253
      MM=MM-1
      GO TO 251
 1253 DELTEP= DELZEE/(FV-RV)
  254 DELTEE=(ZBOTOM-ZCUR)/(FV-RV+VB(LL))
      IF( DELTEE.LT. DELTEF) GO TO 255
      DELTEE= DELTEP
  255 IF(DELTEE.GE.0.0) GC TO 278
  256 IRROR=-256
      GO TO 7734
C
```

```
C 253 COMPUTE THE TIMES REQUIRED FOR THE PARTICLE TO MOVE TO THE TOP OF
C     THE HODOGRAPH STRATUM IN WHICH IT RESIDES,AND TO THE BASE OF THE
C     CLOUD.  USE THE SMALLER OF THESE TIMES.
C
  253 DELTEP= ((ZV(MM)+ ZV(MM+1))/2.0 -ZCUR)/(FV-RV)
      GO TO 254
C
  278 TMIUDT=TCUR-DELTEE
      IF(IC(8).EQ.0)GO TO 279
      IAC=278
      WRITE(ISOUT,2310)IAC,
     1                   J,LL,MM,LLL,DELTEE,ZBOTOM,RV,FV,TCUR,ZCUR,TMIUDT
 2310 FORMAT(I5/
     1          4I5/7(3X,E12.5))
C
C     FIND THE POSITION OF TIME TMIUDT IN THE CLOUD RISE TABLE.
C
  279 LLL=LL
  280 IF(TC(LL).LE.TMIUDT) GO TO 290
      LL=LL-1
      IF(LL.GE.1) GO TO 280
      TMIUDT= TC(1)
      LL=1
      DELTEE=TCUR-TC(1)
C
C     COMPUTE THE CLOUD BOTTOM HEIGHT,ZBOTOM,AT THE TIME TMIUDT.
C
  290 ZBOTOM=ZB(LL)+VB(LL)*(TMIUDT-TC(LL))
C
C     IS THIS CLOUD BOTTOM ALTITUDE LESS THAN OR EQUAL TO THE PARTICLE
C     ALTITUDE-
C        YES TO 295 OR 320
C        NO  TO 300
C
  291 TMPDZ=ZBOTOM-ZCUR-(FV-RV)*DELTEE
      IF(ABS(TMPDZ).LE.5.0) GO TO 320
      IF(TMPDZ)295,320,300
C
C 295 CLOUD BASE AND PARTICLE TRAJECTORIES HAVE CROSSED.  IF POSSIBLE,
C     GO BACK TO THE STEP JUST BEFORE THE CROSSING OCCURS.
C
  295 LL=LL+1
      IF(LLL-LL)296,310,297
  296 LL=LLL
      GO TO 310
  297 DELTEE= TCUR-TC(LL)
      ZBOTOM=ZB(LL)
      TMPDZ=ZBOTOM-ZCUR-(FV-RV)*DELTEE
      IF(ABS(TMPDZ).LE.5.0) GO TO 311
      IF(TMPDZ)295,311,300
C
C 300 INCREMENT PARTICLE SHIFT PARAMETERS
  300 DX=DX+VX( MM) *DELTEE
      DY=DY+VY( MM) *DELTEE
      TCUR=TCUR-DELTEE
      ZCUR=ZCUR+(FV-RV)*DELTEE
C     COMPUTE ATMOSPHERE PROPERTIES AT ZCUR
      CALL TRPL(ZCUR,NAT,ALT,ATP,T)
      CALL TRPL(ZCUR,NAT,ALT,PRS,P)
      CALL TRPL(ZCUR,NAT,ALT,RHO,DEN)
```

```
      CALL TRPL(ZCUR,NAT,ALT,ETA,VIS)                                   WNDSF421
      IF(IC(8).EQ.0)GO TO 245                                           WNDSF422
      IAC=300                                                           WNDSF423
      WRITE(ISOUT,2310)IAC,                                             WNDSF424
     1                   J,LL,MM,LLL,DELTEE,ZBOTOM,RV,FV,TCUR,ZCUR,TMIUDT WNDSF425
      GO TO 245                                                         WNDSF426
C                                                                       WNDSF427
C                                                                       WNDSF428
C 310 MAKE FINAL ADJUSTMENTS TO PARTICE SHIFT PARAMETERS.               WNDSF429
C                                                                       WNDSF430
C                                                                       WNDSF431
  310 ZBOTOM=ZB( LL)+VB( LL)*(TCUR-TC( LL))                             WNDSF432
      DELTEE=(ZBOTOM-ZCUR)/(VB( LL)-RV+FV)                              WNDSF433
  311 IF(DELTEE.LT. 0.0)DELTEE=0.                                       WNDSF434
      IF((TCUR-DELTEE).LT. 0.0) DELTEE=0.0                              WNDSF435
  315 IF(TC(LL) .LE. (TCUR-DELTEE-0.1)) GO TO 320                       WNDSF436
      LL=LL-1                                                           WNDSF437
      IF(LL.GE.1) GO TO 315                                             WNDSF438
      LL=1                                                              WNDSF439
  320 DELTRP =(TCUR -DELTEE-TC( LL))/(TC( LL+1) -TC( LL))               WNDSF440
  322 DX=DX+VX( MM)*DELTEE + XC( LL)   + (XC( LL+1) -XC( LL))*DELTRP    WNDSF441
      DY=DY+VY( MM)*DELTEE + YC( LL)   + (YC( LL+1) -YC( LL))*DELTRP    WNDSF442
      IF(IC(8).EQ.0)GO TO 108                                           WNDSF443
      IAC=320                                                           WNDSF444
      WRITE(ISOUT,2310)IAC,                                             WNDSF445
     1                   J,LL,MM,LLL,DELTEE,ZBOTOM,RV,FV,TCUR,ZCUR,TMIUDT WNDSF446
      GO TO 108                                                         WNDSF447
C                                                                       WNDSF448
      END                                                               WNDSF449
```

```
*DECK,ADVEC                                                             ADVEC   1
      SUBROUTINE ADVEC(NET,NETSU,ZBH,TIMUP,USUM,VSUM,DXSUM,DYSUM,RSUM,  ADVEC   2
     1WFZ,TSUM,CAVS,ZCH,ALT,ATP,PRS,RHO,ETA,TMAX,                       ADVEC   3
     2ICF,JCF,NCF,KBHF,NDATF,LTIMF,NATF)                                ADVEC   4
C                                                                       ADVEC   5
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978     ADVEC   6
C                                                                       ADVEC   7
C ********************************************************************ADVEC   8
C                                                                       ADVEC   9
C     FALLOUT PARCELS ARE TRANSPORTED (VIA SR TRANP) BY ADVECTION PLUS  ADVEC  10
C     SETTLING. PARCEL TOP AND BASE ARE TRANSPORTED SEPARATELY, AND THE ADVEC  11
C     RESULTS ARE SMEARED. THE /COMMON/ VARIABLE ZP IS REDEFINED.       ADVEC  12
C                                                                       ADVEC  13
C ********************************************************************ADVEC  14
C                                                                       ADVEC  15
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO               ADVEC  16
      COMMON /PARCL/  CROSS,DOWN,DWAF,EDDY,NDATP,PMAS,PSIZ,RHOP,RWAF,   ADVEC  17
     1 TP,XP,YP,ZLOW,ZP                                                 ADVEC  18
      COMMON /SPACE/ WIN1,XLLC,YLLC,ZMAX,ZMIN,TIMEX                     ADVEC  19
C                                                                       ADVEC  20
      DIMENSION NET(ICF,JCF),NETSU(NCF),ZBH(KBHF),USUM(KBHF,NDATF,LTIMF)ADVEC  21
      DIMENSION VSUM(KBHF,NDATF,LTIMF),DXSUM(KBHF,NDATF,LTIMF)          ADVEC  22
      DIMENSION DYSUM(KBHF,NDATF,LTIMF),TIMUP(LTIMF),ZCH(KBHF)          ADVEC  23
      DIMENSION CAVS(KBHF),WFZ(KBHF,NDATF,LTIMF),TSUM(KBHF)             ADVEC  24
      DIMENSION RSUM(KBHF,NDATF,LTIMF)                                  ADVEC  25
      DIMENSION ALT(NATF),ATP(NATF),PRS(NATF),RHO(NATF),ETA(NATF)       ADVEC  26
```

```
C
      DATA EPS/0.1/
C
      MC3=MC(3)
CHANGE ZP FROM PARCEL CENTER TO PARCEL BASE ALTITUDE.
      ZP=ZLOW
CALCULATE TRANSPORT OF PARCEL BASE.
      IF (    (ZP-ZMIN).GT.EPS) GO TO 1411
      TOL=TP
      XOL=XP
      YOL=YP
      ZOL=ZP
      ROL=0.
      SIGXL=RWAF
      SIGYL=RWAF
      GO TO 1412
 1411 CALL        TRANP(NET,NETSU,ZBH,TIMUP,USUM,VSUM,DXSUM,DYSUM,RSUM,
     1WFZ,CAVS,TSUM,TMAX,XOL,YOL,ZOL,TOL,SIGXL,SIGYL,ROL,NDATL,
     2ICF,JCF,NCF,KBHF,NDATF,LTIMF)
CHANGE ZP FROM PARCEL BASE TO PARCEL TOP ALTITUDE.
 1412 ZP=ZLOW+DWAF
CALCULATE TRANSPORT OF PARCEL TOP.
      IF( ZP-ZMIN .GT.EPS) GO TO 1414
      TOU=TP
      XOU=XP
      YOU=YP
      ZOU=ZP
      ROU=0.
      SIGXU=RWAF
      SIGYU=RWAF
      GO TO 1415
 1414 CALL        TRANP(NET,NETSU,ZBH,TIMUP,USUM,VSUM,DXSUM,DYSUM,RSUM,
     1WFZ,CAVS,TSUM,TMAX,XOU,YOU,ZOU,TOU,SIGXU,SIGYU,ROU,NDATU,
     2ICF,JCF,NCF,KBHF,NDATF,LTIMF)
CALCULATE SMEAR OF PARCEL TOP AND BASE RESULTS.
 1415 ZOUTN=(ZOL+ZOU)/2.
      TOUTN=(TOL+TOU)/2.
      IF(ABS(XOU-XOL).GE.1.0E-30) GO TO 1404
      IF(ABS(YOU-YOL).GE.1.0E-30) GO TO 1403
      ROUTN=0.
      GO TO 1405
 1403 ROUTN=1.57079633
      GO TO 1405
 1404 ROUTN=ATAN((YOU-YOL)/(XOU-XOL))
      IF(XOU-XOL .LT. 0.0) ROUTN=ROUTN - SIGN(3.141592654,ROUTN)
 1405 R=ROUTN-ROL
      SXL=1./SQRT((COS(R)/SIGXL)**2+(SIN(R)/SIGYL)**2)
      SYL=1./SQRT((SIN(R)/SIGXL)**2+(COS(R)/SIGYL)**2)
      R=ROUTN-ROU
      SXU=1./SQRT((COS(R)/SIGXU)**2+(SIN(R)/SIGYU)**2)
      SYU=1./SQRT((SIN(R)/SIGXU)**2+(COS(R)/SIGYU)**2)
      SXOTN=(SXU+SXL+SQRT((XOU-XOL)**2+(YOU-YOL)**2))/2.
      SYOTN=SQRT(SYU*SYL)
      XOUTN=XOL+(SXOTN-SXL)*COS(ROUTN)
      YOUTN=YOL+(SXOTN-SXL)*SIN(ROUTN)
 1450 CALL DUMPER(XOUTN,YOUTN,ZOUTN,TOUTN,SXOTN,SYOTN,PMAS,PSIZ,ROUTN,J,
     1ISOUT,IPOUT,MC3)
      RETURN
      END
```

```
*DECK,BOUN
      SUBROUTINE BOUN(NET,NETSU,XT,YT,XO,YO,XC,YC,ICF,JCF,NCF)
C     MARCH, 1971
C     SUBROUTINE BOUN DETERMINES AN INTERPOLATED PARCEL POSITION
C     (INFINITESMALLY DISPLACED EXTERNAL TO A CELL BOUNDARY) GIVEN THE
C     PREVIOUS PARCEL POSITION INTERNAL TO THIS CELL AND THE ANTICIPATED
C     PARCEL POSITION EXTERNAL TO THIS CELL
C     XT    - ANTICIPATED PARCEL POSITION X COORDINATE
C     YT    - ANTICIPATED PARCEL POSITION Y COORDINATE
C     XO    - PREVIOUS PARCEL POSITION X COORDINATE
C     YO    - PREVIOUS PARCEL POSITION Y COORDINATE
C     XC    - INTERPOLATED PARCEL POSITION X COORDINATE
C     YC    - INTERPOLATED PARCEL POSITION Y COORDINATE
C     ADISP - SMALL X DISPLACEMENT. + OR - EPS.
C     BDISP - SMALL Y DISPLACEMENT. + OR - EPS.
      DIMENSION NET(ICF,JCF),NETSU(NCF)
      DATA EPS/0.5/
CLEAR ADISP AND BDISP
      ADISP=0.
      BDISP=0.
COMPUTE XL,XR,YL, AND YU FOR (XO,YO)
      CALL NEST(NET,NETSU,XO,YO,NDATO,XL,XR,YL,YU, ICF,JCF,NCF)
CUT AND TRY XC
CHECK IF XT LIES TO THE RIGHT OF XR
      IF(XT.LE.XR) GO TO 102
      XC=XR
      ADISP=EPS
      GO TO 104
CHECK IF XT LIES TO THE LEFT OF XL
  102 XC=XL
      IF(XT.GE.XL) GO TO 106
      ADISP=-EPS
COMPUTE YC
  104 YC=YO+(YT-YO)*(XC-XO)/(XT-XO)
CHECK IF YC LIES BETWEEN YL AND YU
      IF((YU.GE.YC).AND.(YC.GE.YL)) GO TO 111
CUT AND TRY YC
CHECK IF YT LIES ABOVE YU
  106 IF(YT.LT.YU) GO TO 108
      YC=YU
  107 BDISP=EPS
      GO TO 110
CHECK IF YT LIES BELOW YL
  108 YC=YL
      IF(YT.GT.YL) GO TO 111
      BDISP=-EPS
COMPUTE XC
  110 XC=XO+(XT-XO)*(YC-YO)/(YT-YO)
CREATE INFINITESMAL DISPLACEMENT
  111 XC=XC+ADISP
      YC=YC+BDISP
      RETURN
      END
```

```
*DECK,CALIB
      SUBROUTINE CALIB(A,NX,AN,NS,N)
C     MARCH, 1971
C     SUBROUTINE CALIB DETERMINES A JUSTIFIED INDEX WHICH RELATES AN
C     INPUT DATA POINT TO ITS CORRESPONDING POSITION IN AN INPUT ARRAY.
C
C     A      - INPUT DATA ARRAY
C     NX     - INPUT MAXIMUM INDEX OF A
C     AN     - INPUT DATA POINT
C     NS     - INDEX JUSTIFICATION CODE.   WHEN GIVEN (BY INPUT) THE
C              FOLLOWING VALUES, N IS DETERMINED SUCH THAT -
C                +1 A(N) IS .LE. AN
C                -1 A(N) IS .GT. AN
C     N      - OUTPUT INDEX
C
      DIMENSION A(NX)
      EPS = 1.E-6 * NS * ABS( AN )
      N=0
COMMENCE SEARCH FOR N
    1 N=N+1
      NN=N+(1+NS)/2
COMPARE A(NN) WITH AN ONLY IF  NN IS LESS THAN NX+1
      IF((NN.LT.NX+1).AND.(A(NN).LT.AN+EPS)) GO TO 1
      RETURN
      END
```

```
*DECK,CNTR
      SUBROUTINE CNTR(NET,NETSU,NDATA,XG,YG,ICF,JCF,NCF)
C     MARCH, 1971
C     SUBROUTINE CNTR DETERMINES THE X,Y COORDINATES AT THE CENTER OF A
C     HORIZONTAL SPACE RESOLUTION  MESH OR SUB-MESH.
C     NDATA - ATMOS. HORIZ. SPACE NET MESH OR SUB-MESH INDEX
C     XG    - NET MESH OR SUB-MESH CENTER POSITION X COORDINATE
C     YG    - NET MESH OR SUB-MESH CENTER POSITION Y COORDINATE
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
      COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX
      DIMENSION NET(ICF,JCF),NETSU(NCF)
      DATA PROGRM/6HCNTR  /
      VINT=WINT/2.
      IG=0
      JG=0
      NDBLE=1
      NSTOR=NDATA
COMMENCE SEARCH LOOPS FOR IC AND JC
    1 DO 2 JC=1,JCX
      DO 2 IC=1,ICX
CHECK IF NSTOR CAN BE FOUND IN NET
      IF(NET(IC,JC).EQ.NSTOR) GO TO 9
    2 CONTINUE
COMMENCE SEARCH LOOP FOR NC
      DO 3 NC=1,NCX
CHECK IF NSTOR CAN BE FOUND IN NETSU
      IF(NETSU(NC).EQ.NSTOR) GO TO 4
    3 CONTINUE
      CALL ERROR(PROGRM,-3,ISOUT)
```

```
COMMENCE TRACEBACK THROUGH POINTER SEQUENCE
    4 NG=NC-4*(NC/4)+1
      ING=+1
      JNG=-1
CONVERT NSTOR TO ITS IMMEDIATELY PRECEDING POINTER
      NSTOR=-NC+3
      GO TO (8,7,6,5), NG
    5 ING=ING+2
      NSTOR=NSTOR+1
    6 JNG=JNG+2
      NSTOR=NSTOR+1
    7 ING=ING-2
      NSTOR=NSTOR-3
COMPUTE QUDRANT LABELS IG AND JG
    8 IG=IG+ING*NDBLE
      JG=JG+JNG*NDBLE
      NDBLE=2*NDBLE
      VINT=VINT/2.
CONTINUE SEARCH FOR IC AND JC
      GO TO 1
COMPUTE XG AND YG
    9 IG=IG+NDBLE
      JG=JG+NDBLE
      XG=WINT*FLOAT(IC-1)+VINT*FLOAT(IG)+XLLC
      YG=WINT*FLOAT(JC-1)+VINT*FLOAT(JG)+YLLC
      RETURN
      END
```

```
*DECK,DATIN
      SUBROUTINE DATIN(NET,NETSU,ZBH,ZCH,TIMUP,USUM,VSUM,RSUM,WFZ,
     1DXSUM,DYSUM,CAVS,MARY,ICF,JCF,NCF,MARF,KBHF,NDATF,LTIMF)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     READS AND PROCESSES WIND DATA.  READS AND PROCESSES TURBULENCE
C     DATA, OR CALCULATES TURBULENCE DATA.  CALLS SUBROUTINES ONEDIN,
C     TRIDIN AND WILKNS FOR ASSISTANCE.
C
C ********************************************************************
C
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
      COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
C
      INTEGER WIND,TURB,METEOR,RESOLV,SPEC,FORM,DONE,WILKS
      DIMENSION NET(ICF,JCF),NETSU(NCF),MARY(MARF),ZBH(KBHF),ZCH(KBHF)
      DIMENSION TIMUP(LTIMF),USUM(KBHF,NDATF,LTIMF)
      DIMENSION VSUM(KBHF,NDATF,LTIMF),WFZ(KBHF,NDATF,LTIMF)
      DIMENSION DXSUM(KBHF,NDATF,LTIMF),DYSUM(KBHF,NDATF,LTIMF)
      DIMENSION RSUM(KBHF,NDATF,LTIMF)
C
      DATA PROGRM ,ALIMIT ,WIND  ,TURB  ,DONE  ,METEOR,RESOLV
     1   /6HDATIN ,999999.,4HWIND,4HTURB,4HNO M,4HMETE,4HRESO/
      DATA INPU   , WILKS
     1  /4HINPU   ,4HWILK   /
```

```
C
  1  FORMAT(A4, 2X, A4, 18X, I2, F10.0)
  10 FORMAT(///15X17HATMOSPHERE UPDATEI4, 22H FOR TIMES LATER THAN ,
    1 E12.5, 6H SEC (F8.3, 7H HOURS)/)
  11 FORMAT(21X50H* * * * * * * * * WINDFIELD DATA * * * * * * * * * */)
  12 FORMAT(21X51H* * * * * * * * * TURBULENCE DATA * * * * * * * * * */)
 21  FORMAT(1H0,10X,  79HCOUNT OF UPDATA DATA SETS DOES NOT TALLY WITH
    1SPECIFIED UPDATE SEQUENCE NUMBERS)
 22  FORMAT(1H0,10X, 22H A DATA SET IS MISSING)
  23 FORMAT(///20X,   59HUPDATE INDEX INCONSISTENT WITH UPDATE TIME ON
    1AN INPUT CARD)
  25 FORMAT( 1H0, 81HFIRST UPDATE WINDS MUST BE INPUT FIRST WHEN 1-DIME
    1NSIONAL DATA PROCESSING IS USED)
C
     DO 50 L=1,LTIMF
     TIMUP(L)=ALIMIT
     DO 50 N=1,NDATF
     USUM(1,N,L)=ALIMIT
 50  DXSUM(1,N,L)=ALIMIT
     ZCH(1)=ALIMIT
     IF(MC(1).EQ.0)GO TO 500
CONSTRUCT THE HORIZONTAL SPACE RESOLUTION NET
     CALL        GETUP(NET,NETSU,MARY,MARF,ICF,JCF,NCF,NDATF)
CONSTRUCT THE ATMOSPHERE  STRATA
     CALL        LAYERS(ZCH,ZBH,KBHF)
     GO TO 1000
 500 ICX=1
     JCX=1
     NDATX=1
     NET(1,1)=1
COPY IN DATA SET SPECIFICATIONS
 1000 LTIMX=0
 1002 READ(ISIN,1)SPEC,FORM,LTIM,UPTIMH
     IF(SPEC.EQ.DONE)GO TO 3000
 1003 IF(LTIM.LT.1.OR.LTIM.GT.LTIMF)CALL ERROR (PROGRM,-1003,ISOUT)
     UPTIMS=UPTIMH*3600.
 1004 IF(TIMUP(LTIM) .NE. ALIMIT)IF(TIMUP(LTIM)-UPTIMS)5003,1050,5003
     TIMUP(LTIM)=UPTIMS
 1050 IF(MC(2) .NE. 1) WRITE(ISOUT,10) LTIM,UPTIMS,UPTIMH
CHECK IF UPDATE 1 WINDS ARE INPUT FIRST WHEN 1-D PROCESSING IS SPECIFIED
 1051 IF(LTIM .GT. 1 .OR. SPEC .EQ. TURB .AND. MC(1) .EQ. 0)
    1  IF(LTIMX-1)1052,1053,1053
     GO TO 1053
 1052 WRITE(ISOUT,25)
     CALL ERROR(PROGRM,-1052,ISOUT)
 1053 IF(SPEC.EQ.TURB)GO TO 2000
 1055 IF(SPEC.NE.WIND)CALL ERROR (PROGRM,-1055,ISOUT)
CONSTRUCT WIND DATA ARRAYS
     IF(MC(2) .NE. 1) WRITE(ISOUT,11)
     LTIMX=LTIMX+1
 1060 IF(LTIMX.GT.LTIMF)CALL ERROR(PROGRM,-1060,ISOUT)
     IF(MC(1) .NE. 0) GO TO 1100
CONSTRUCT WIND DATA ARRAYS VIA THE SIMPLIFIED 1-DIMENSIONAL METHOD
     CALL        ONEDIN(ZCH,ZBH,CAVS,USUM ,VSUM ,LTIM,KBHF,NDATF,LTIMF,
    1 FORM,SPEC)
     DO 1070 N=1,NDATX
     DO 1070 K=1,KBHX
 1070 WFZ(K,N,LTIM)=0.0
     GO TO 1200
CONSTRUCT THE WIND DATA ARRAYS VIA THE 3-DIMENSIONAL METHOD
```

```
 1100 CALL       TRIDIN(NET,NETSU,ZCH,USUM ,VSUM ,WFZ,LTIM,ICF,JCF,NCF,
     1KBHF,NDATF,LTIMF,FORM,SPEC)
COMPUTE WIND DIRECTION ANGLE ARRAYS
 1200 CONTINUE
      DO 1300 N=1,NDATX
      DO 1300 K=1,KBHX
      IF(ABS(USUM(K,N,LTIM)).GE.1.0E-30)GO TO 1254
      IF(ABS(VSUM(K,N,LTIM)).GE.1.0E-30)GO TO 1253
      RSUM(K,N,LTIM)=0.0
      GO TO 1300
 1253 RSUM(K,N,LTIM)=SIGN(1.57079633,VSUM(K,N,LTIM))
      GO TO 1300
 1254 RSUM(K,N,LTIM)=ATAN(VSUM(K,N,LTIM)/USUM(K,N,LTIM))
      IF(USUM(K,N,LTIM) .LT. 0.0) RSUM(K,N,LTIM) = RSUM(K,N,LTIM) -
     1  SIGN(3.141592654,RSUM(K,N,LTIM))
 1300 CONTINUE
      GO TO 1002
CONSTRUCT THE TURBULENCE DATA ARRAYS
 2000 IF(MC(2) .NE. 1) WRITE(ISOUT,12)
      IF(FORM .EQ. INPU) GO TO 2100
 2001 IF(FORM .NE. WILKS ) CALL ERROR(PROGRM,-2001,ISOUT)
CALCULATE TURBULENCE DATA BY WILKINS' FUNCTION OF RECIPROCAL ALTITUDE.
C     TURBULENCE WILL BE HORIZONTALLY UNIFORM.
      CALL       WILKNS (ZCH,DXSUM,DYSUM,CAVS,TIMUP,KBHF,NDATF,LTIMF,
     1 LTIM)
      GO TO 1002
 2100 FORM=RESOLV
      IF(MC(1) .NE. 0) GO TO 2200
CONSTRUCT THE TURBULENCE DATA ARRAYS VIA THE SIMPLIFIED 1-DIMENSIONAL
C     METHOD
      CALL       ONEDIN(ZCH,ZBH,CAVS,DXSUM,DYSUM,LTIM,KBHF,NDATF,LTIMF,
     1 FORM,SPEC)
      GO TO 1002
CONSTRUCT THE TURBULENCE DATA ARRAYS VIA THE 3-DIMENSIONAL METHOD
 2200 CALL       TRIDIN(NET,NETSU,ZCH,DXSUM,DYSUM,DUM,LTIM,ICF,JCF,NCF,
     1KBHF,NDATF,LTIMF,FORM,SPEC)
      GO TO 1002
 3000 CONTINUE
CHECK DATA FOR ERRORS
      LTIM=0
      DO 3100 L=1,LTIMF
      IF(TIMUP(L).EQ.ALIMIT)GO TO 3100
      LTIM=LTIM+1
 3100 CONTINUE
      IF(LTIM.EQ.LTIMX)GO TO 3200
      WRITE(ISOUT,21)
 3105 CALL ERROR (PROGRM,-3105,ISOUT)
 3200 DO 3250 L=1,LTIMX
      DO 3250 N=1,NDATX
      IF(USUM(1,N,L).EQ.ALIMIT.OR.DXSUM(1,N,L).EQ.ALIMIT)GO TO 3275
 3250 CONTINUE
      RETURN
 3275 WRITE (ISOUT,22)
 3276 CALL ERROR(PROGRM,-3276,ISOUT)
 5003 WRITE(ISOUT,23)
      CALL ERROR(PROGRM, -1004, ISOUT)
      END
```

```
*DECK,DTMEX
      SUBROUTINE DTMEX(NUMTAP)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C                     DIFFUSIVE TRANSPORT MODULE
C
C     ARRAY DIMENSIONS MUST BE SET IN THIS PROGRAM.  THESE ARE MAXIMUM
C     DIMENSIONS TO BE USED IN THIS RUN.  DIMENSION MNEMONICS AND THE
C     DATA FIELD LENGTHS THEY CONTROL ARE AS FOLLOWS -
C      ICF,JCF- PRIMARY HORIZONTAL SPACE RESOLUTION NET INDICES
C               (ARRAY NET)
C               ICF IS THE NUMBER OF  EAST-WEST  NET SUBDIVISIONS
C               JCF IS THE NUMBER OF NORTH-SOUTH NET SUBDIVISIONS
C      KBHF   - ATMOSPHERE STRATA FOR WIND AND TURBULENCE DATA
C               (ARRAYS USUM,VSUM,WFZ,DXSUM,DYSUM,RSUM,TSUM,ZBH,ZCH,
C                CAVS,WAVG)
C      LTIMF  - WIND AND TURBULENCE DATA UPDATES(INCLUDING INITIAL DATA)
C               (ARRAYS USUM,VSUM,WFZ,DXSUM,DYSUM,RSUM,WAVG,HDAV)
C      MARF   - DIMENSION OF THE ARRAY (MARY) THAT RECIEVES THE FLAGS
C               WHICH DEFINE THE HORIZONTAL SPACE RESOLUTION NET
C      NATF   - ATMOSPHERE STRATA FOR, PRES, TEMP, ETC. (ALWAYS 256)
C      NDATF  - HORIZONTAL SPACE RESOLUTION NET AND SUB-NET MESHES
C               (ARRAYS USUM,VSUM,WFZ,DXSUM,DYSUM,RSUM)
C      NCF    - HORIZINTAL SPACE RESOLUTION NET MESH SUBDIVISIONS
C               (ARRAY NETSU)
C
C     *************************** GLOSSARY ***************************
C
C     ALT   - ALTITUDES FOR ATMOS. DENSITY AND VISCOSITY TABLE
C     CAVS  - PARTICLE FALL RATE FOR EACH ATMOS. STRATUM
C     CROSS - CROSSWIND CROSSING TRAJECTORIES CORRECTION TO DISPERSION
C     DOWN  - DOWNWIND CROSSING TRAJECTORIES CORRECTION TO DISPERSION
C     DWAF  - PARCEL VERT. THICKNESS BEFORE ADVECTION
C     DXSUM - TURBULENCE X COMPONENT (WEIGHTED SUM) 3-DIM. DATA ARRAY
C     DYSUM - TURBULENCE Y COMPONENT (WEIGHTED SUM) 3-DIM. DATA ARRAY
C     EDDY  - RATIO OF LAGRANGIAN TO EULERIAN TIME SCALES.  SET TO 4.0
C             BY PGM. IF INPUT AS ZERO.
C     ETA   - DYNAMIC VISCOSITY OF AIR
C     FAV   - PARTICLE SETTLING RATE AT MID ATMOSPHERE ALTITUDE
C     HDAV  - AVERAGE HORIZONTAL DIFFUSIVITY OR TURBULENCE DISSIPATION
C             RATE FOR EACH ATMOSPHERE UPDATE.
C     ICF   - MAX. FORMAL DIM. CORRESPONDING TO ICX
C     ICX   - OBJECT-TIME MAX. NUMBER OF WEST-EAST MESHES IN ARRAY NET
C     IPOUT - LOGICAL UNIT NUMBER OF DIFF. TRANS. MOD. OUTPUT TAPE
C     ISIN  - LOGICAL UNIT NUMBER OF SYSTEM INPUT TAPE
C     ISOUT - LOGICAL UNIT NUMBER OF SYSTEM OUTPUT TAPE
C     JPARN - LOGICAL UNIT NUMBER OF  ICRM OUTPUT TAPE
C     JCF   - MAX. FORMAL DIM. CORRESPONDING TO JCX
C     JCX   - OBJECT-TIME MAX. NUMBER OF SOUTH-NORTH MESHES IN ARRAY NET
C     KBHF  - MAX. FORMAL DIM. CORRESPONDING TO KBHX
C     KBHX  - OBJECT-TIME MAX. ATMOSPHERE LAYER INDEX FOR WIND AND TURB.
C     LTIMF - MAX. FORMAL DIM. CORRESPONDING TO LTIMX
C     LTIMX - OBJECT-TIME MAX. INDEX FOR WIND AND TURB. UPDATES
C             (INCLUDES THE INITIAL SET)
C     MARF  - MAX. FORMAL DIM. CORRESPONDING TO MARX
C     MARX  - OBJECT-TIME MAX. DIM. OF ARRAY MARY (MARX=ICX*JCX)
C     MARY  - HORIZ. ATMOS. SPACE RESOLUTION NET MESH AND SUB-MESH
```

```
C              CONTROL FLAGS DATA ARRAY
C        MC    - CONTROL INTEGER DATA ARRAY
C        NAT   - NUMBER OF ALTITUDE STRATA IN ATMOS. T,P,RHO, ETC. TABLE
C        NATF  - MAX. FORMAL DIM. CORRESPONDING TO NAT (SEE ABOVE)
C        NBLK  - RECORD BLOCK SIZE FOR FALLOUT PARCEL DATA ARRAYS
C        NCF   - MAX. FORMAL DIM. CORRESPONDING TO NCX
C        NCX   - OBJECT-TIME MAX. DIM. OF ARRAY NETSU
C              4*(NUMBER OF ZEROS PUNCHED IN MARY INPUT CARDS)
C        NDATF - MAX. FORMAL DIM. CORRESPONDING TO NDATX
C        NDATX - NUMBER OF ONES (1) PUNCHED IN MARY INPUT CARDS (I.E.,
C              TOTAL NUMBER OF HORIZONTAL SPACE RESOLUTION MESHES)
C        NET   - PRIMARY HORIZONTAL SPACE RESOLUTION MESH ARRAY
C        NETSU - HORIZONTAL SPACE RESOLUTION SUB-MESH ARRAY
C        NSEQO - STORAGE SEQUENCE  INDEX  OF FIRST PARCEL TO BE TRANSPORTED
C        N1,N2,- INPUT DATA POINTERS
C        RADC  - CONVERSION FACTOR FROM DEGREES TO RADIANS=PI/180
C        RHO   - ATMOS. DENSITY
C        RLH   - RELATIVE HUMIDITY
C        RO    - WIND HEADING ORIENTATION ANGLE AFTER ADVECTION
C        RHOP  - FALLOUT PARTICLE DENSITY
C        RSUM  - WIND HEADING ORIENTATION ANGLE (WEIGHTED SUM) 3-DIM. ARRAY
C        RWAF  - PARCEL RADIUS IN PARCEL CENTRAL PLANE BEFORE ADVECTION
C        SIGW  - STANDARD DEVIATION OF VERTICAL TURBULENCE (M/SEC)
C        SIGXO - PARCEL DOWNWIND DISPERSION PARAMETER
C        SIGYO - PARCEL CROSSIND DISPERSION PARAMETER
C        TIME  - TIME AT ONSET OF CURRENT PARCEL TIME INTERVAL
C        TIMEX - OVERALL TRANSPORT TIME LIMIT
C        TIMUP - ATMOSPHERE UPDATE TIMETABLE DATA ARRAY
C        TMAX  - TRANSPORT TIME LIMIT FOR A PARTICLE SIZE CLASS
C        TO    - TIME AFTER PARCEL ADVECTION
C        TP    - TIME BEFORE PARCEL ADVECTION
C        USUM  - WIND X COMPONENT (WEIGHTED SUM) 3-DIM. DATA ARRAY
C        VARL  - DISPERSION VARIANCE OF A PUFF ABOVE WHICH THE DISPERSION
C              RATE BECOMES CONSTANT
C        VSUM  - WIND Y COMPONENT (WEIGHTED SUM) 3-DIM. DATA ARRAY
C        WAVG  - AVG. ATMOS. VERT. WIND  PER UPDATE PER STRATUM
C        WAVGK - OVERALL AVERAGE VERTICAL WIND COMPONENT
C        WFZ   - WIND Z COMPONENT 3-DIM. DATA ARRAY
C        WINT  - MESH INCREMENT OF THE PRIMARY HORIZONTAL SPACE RESOLUTION
C              NET
C        XLLC  - X COORDINATE OF SOUTH-WEST CORNER OF ATMOS. SPACE
C        XO    - PARCEL CENTER X COORDINATE AFTER ADVECTION
C        XP    - PARCEL CENTER X COORDINATE BEFORE ADVECTION
C        YLLC  - X COORDINATE OF SOUTH-WEST CORNER OF ATMOS. SPACE
C        YO    - PARCEL CENTER Y COORDINATE AFTER ADVECTION
C        YP    - PARCEL CENTER Y COORDINATE BEFORE ADVECTION
C        ZBH   - ATMOSPHERE STRATA BASE-ALTITUDE DATA ARRAY
C        ZCH   - ATMOSPHERE STRATA MID-ALTITUDE DATA ARRAY
C        ZLOW  - PARCEL BASE ALTITUDE BEFORE ADVECTION
C        ZMAX  - ATMOSPHERE TOP ALTITUDE   RELATIVE TO MEAN SEA LEVEL
C        ZMIN  - DEPOSITION PLANE ALTITUDE RELATIVE TO MEAN SEA LEVEL
C        ZO    - PARCEL CENTER Z COORDINATE AFTER ADVECTION
C        ZP    - PARCEL CENTER Z COORDINATE BEFORE ADVECTION, ECXEPT AS
C              REDEFINED IN SUB. ADVEC
C        ZUPP  - PARCEL TOP ALTITUDE BEFORE ADVECTION. ZLOW+DWAF
C
C *********************************************************************
C
      COMMON /CNTRCL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
      DIMENSION NUMTAP(15)
```

```
      DIMENSION ALT(256),ATP(256),PRS(256),RLH(256),RHO(256),ETA(256)
      DIMENSION NET(     1,      1),NETSU(     1),WAVG(    35,      6)
      DIMENSION  USUM(     35,      1,      6), VSUM(     35,      1,      6)
      DIMENSION DXSUM(     35,      1,      6),DYSUM(     35,      1,      6)
      DIMENSION  RSUM(     35,      1,      6),CAVS(     35),HDAV(      6)
      DIMENSION ZBH(   35), ZCH(   35), TIMUP(    6), MARY(    1)
      DIMENSION   WFZ(     35,      1,      6),TSUM(     35)
      DATA     ICF    ,JCF    ,MARF   ,NCF    ,NDATF  ,KBHF   ,LTIMF
     1         / 1    , 1     , 1     , 1     ,     1 ,  35   ,     6 /
      NATF=256
      ISIN =NUMTAP( 1)
      ISOUT=NUMTAP( 2)
      IPOUT=NUMTAP( 3)
      JPARN=NUMTAP( 4)
      DO 1 N=1,NCF
    1 NETSU(N)=0
      DO 2 J=1,JCF
      DO 2 I=1,ICF
    2 NET(I,J)=0
      DO 3 M=1,MARF
    3 MARY(M)=0
      DO 4 K=1,KBHF
      CAVS(K)=0.
      TSUM(K)=0.
      ZBH(K)=0.
    4 ZCH(K)=0.
      DO 5 L=1,LTIMF
      HDAV(L)=0.
      TIMUP(L)=0.
      DO 5 K=1,KBHF
    5 WAVG(K,L)=0.0
      DO 6 L=1,LTIMF
      DO 6 N=1,NDATF
      DO 6 K=1,KBHF
      WFZ(K,N,L)=0.
      USUM(K,N,L)=0.
      VSUM(K,N,L)=0.
      DXSUM(K,N,L)=0.
      DYSUM(K,N,L)=0.
    6 RSUM(K,N,L)=0.
COMMENCE READING DATA INPUTS FROM TAPES ISIN AND JPARN
      CALL       DTMINT(ALT,ATP,PRS,RLH,RHO,ETA,NATF)
CONTSRUCT AND FILL IN THE ATMOSPHERIC LATTICE AND UPDATE STRUCTURE
COPY IN AND PROCESS WIND AND TURBULENCE DATA
      CALL       DATIN(NET,NETSU,ZBH,ZCH,TIMUP,USUM,VSUM,RSUM,WFZ,
     1DXSUM,DYSUM,CAVS,MARY,ICF,JCF,NCF,MARF,KBHF,NDATF,LTIMF)
COMPUTE WEIGHTED SUMS OF WIND AND TURBULENCE DATA
      CALL       SUMDAT(NET,NETSU,ZBH,ZCH,WAVG,HDAV,USUM,VSUM,RSUM,WFZ,
     1TIMUP,DXSUM,DYSUM,ICF,JCF,NCF,KBHF,NDATF,LTIMF)
CALCULATE THE DIFFUSIVE TRANSPORT OF PARCELS ACCEPTED FROM TAPE JPARN
COPY OUT RESULTS ONTO TAPE IPOUT
      CALL       SPRVS(NET,NETSU,ZBH,ZCH,TIMUP,USUM,VSUM,DXSUM,DYSUM,
     1RSUM,WFZ,CAVS,HDAV,TSUM,WAVG,ALT,ATP,PRS,RLH,RHO,ETA,
     2ICF,JCF,NCF,KBHF,NDATF,LTIMF,NATF)
      RETURN
      END
```

```
*DECK,DTMINT
      SUBROUTINE DTMINT(ALT,ATP,PRS,RLH,RHO,ETA,NATF)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     DIFFUSIVE TRANSPORT MODULE INITIALIZATION.  READS CARD INPUTS.
C     READS BASIC DATA ON THE BINARY TAPE WRITTEN BY SUBROUTINE WNDSFT
C     OF THE INITIALIZATION AND CLOUD RISE MODULE.   PRINTS HEADER AND
C     BASIC DATA AND INITIALIZES THE DTM BINARY OUTPUT TAPE.
C
C ********************************************************************
C
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
      COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /PARCL/  CROSS,DOWN,DWAF,EDDY,NDATP,PMAS,PSIZ,RHOP,RWAF,
     1 TP,XP,YP,ZLOW,ZP
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX
C
      DIMENSION ALT(NATF),ATP(NATF),PRS(NATF),RLH(NATF),RHO(NATF)
      DIMENSION ETA(NATF),PS(200),DIAM(200),FMASS(200)
      DIMENSION DETID(12),DTMID(12)
C
      DATA PROGRM/6HDTMINT/
C
    1 FORMAT(12A6)
    2 FORMAT(   10X, 54HINITIALIZATION AND CLOUD RISE MODULE IDENTIFICAT
     1ION - ,12A6/ 20X, 44HDIFFUSIVE TRANSPORT MODULE IDENTIFICATION - ,
     2 12A6)
    7 FORMAT(/15X63HTHE CONTROL VARIABLE ARRAY, MC(J), HAS BEEN GIVEN TH
     1E VALUES -)
    8 FORMAT(15X,20I4)
    9 FORMAT(/28X28HTHE TRANSPORT TIME LIMIT IS F12.3, 7H SEC. (F10.5,
     1 7H HOURS))
   10 FORMAT( 15X, 39HA PLANE DEPOSITION SURFACE AT ALTITUDE F9.3,  30H
     1(METERS ABOVE MSL) IS ASSUMED)
   14 FORMAT(15X,46HCOORDINATES OF GROUND ZERO (XGZ,YGZ,ZGZ) ARE (E12.5,
     1 2H, E12.5,2H, E12.5,10H) (METERS)/42X16HDETONATION TIME ISE12.5,
     2 8H SECONDS/)
   21 FORMAT(20I4)
   23 FORMAT( 1H1,///51X, 19H* * * * * * * * * *//55X,11HD E L F I C//
     1                                        12X,101HT H E   D E P
     2A R T M E N T   O F   D E F E N S E   F A L L O U T   P R E D I C
     3T I O N   S Y S T E M//51X19H* * * * * * * * * *////48X,26HDIFFUSI
     4VE TRANSPORT MODULE///          55X, 11HPREPARED BY/ 46X,  30H
     5ATMOSPHERIC SCIENCE ASSOCIATES/  54X, 14HBEDFORD, MASS.
     6//// 41X,  40H*****  SUMMARY OF RUN IDENTIFIERS  *****)
   27 FORMAT(15X, 76HHORIZONTAL COORDINATES OF THE SOUTH WEST CORNER OF
     1THE TRANSPORT SPACE ARE (E12.5, 2H, E12.5,1H)/ 35X, 30HTHE RESOLUT
     2ION NET SPACING IS E12.5, 16H (ALL IN METERS))
   40 FORMAT(8F10.0)
   43 FORMAT(/15X,28HFALLOUT PARTICLE DENSITY IS E12.5,8H KG/M**3,
     1 12H   THERE AREI5, 22H PARTICLE SIZE CLASSES)
   45 FORMAT(/ 15X, 36HPARTICLE PROCESSING BEGINS WITH THE I6, 12H TH PA
     1RTICLE)
   46 FORMAT(1H1)
   47 FORMAT(/ 15X, 20HTRANSPORT IS BY THE )
   48 FORMAT(1H+ 34X, 12HQUICK METHOD)
   49 FORMAT(1H+, 34X, 21HLAYER-BY-LAYER METHOD)
```

```
   50 FORMAT(28X,57HRATIO OF LAGRANGIAN TO EULERIAN TURBULENCE TIME SCAL
     1ES ISF8.3)
C
COPY IN IDENTIFICATION FOR DIFFUSIVE TRANSPORT
      READ (ISIN,1)DTMID
COPY IN OPTION CONTROL CODE DATA FOR DIFFUSIVE TRANSPORT
      READ (ISIN,21)MC
      READ(ISIN,21)ICX,JCX,NSEQO
      IF(ICX .EQ. 0) ICX=1
      IF(JCX .EQ. 0) JCX=1
      IF(NSEQO .EQ. 0)NSEQO=1
      READ(ISIN,40) WINT,XLLC,YLLC,TIMEH,EDDY
      IF(EDDY .EQ. 0.0) EDDY=4.0
COMPOSE ALL TAPES NEEDED FOR DIFFUSIVE TRANSPORT
      REWIND JPARN
      REWIND IPOUT
COPY IN BASIC HEADER DATA FROM ICRM OUTPUT TAPE
      READ (JPARN)FW,SSAM,SLDTMP,TMSD,SD,W,HEIGHT,RHOP,RADMAX,ZMIN
      READ (JPARN)XGZ,YGZ,TGZ
      READ (JPARN)(DETID(I),I=1,12)
      READ (JPARN)NDSTR
      READ (JPARN)(PS(J),DIAM(J),FMASS(J),J=1,NDSTR)
      READ (JPARN)NAT
      READ (JPARN)(ALT(J),ATP(J),PRS(J),RLH(J),RHO(J),ETA(J),J=1,NAT)
COPY OUT HEADER DATA ON TO THE DTM BINARY OUTPUT TAPE
      WRITE(IPOUT)FW,SSAM,SLDTMP,TMSD,SD,W,HEIGHT,RHOP,RADMAX,ZMIN
      WRITE(IPOUT)XGZ,YGZ,TGZ
      WRITE (IPOUT) (DETID(J),J=1,12)
      WRITE (IPOUT) (DTMID(J),J=1,12)
      WRITE (IPOUT)NDSTR
      WRITE (IPOUT)(PS(J),DIAM(J),FMASS(J),J=1,NDSTR)
COPY OUT DIFFUSIVE TRANSPORT HEADING
      WRITE (ISOUT,23)
      WRITE (ISOUT,2)  (DETID(J),J=1,12),(DTMID(J),J=1,12)
      WRITE (ISOUT,7)
      WRITE (ISOUT,8)MC
      TIMEX=TIMEH*3600.
      WRITE (ISOUT,9) TIMEX, TIMEH
      IF(MC(6) .GT. 0) WRITE(ISOUT,50) EDDY
      WRITE(ISOUT,14)XGZ,YGZ,ZMIN,TGZ
      WRITE(ISOUT,27)XLLC,YLLC,WINT
      WRITE(ISOUT,10)ZMIN
      WRITE(ISOUT,43)RHOP,NDSTR
      WRITE(ISOUT,47)
      IF(MC(4) .EQ. 0) WRITE(ISOUT,48)
      IF(MC(4) .NE. 0) WRITE(ISOUT,49)
      IF(NSEQO .NE. 1) WRITE(ISOUT,45) NSEQO
      IF(MC(2) .NE. 1) WRITE(ISOUT,46)
      RETURN
      END
```

```
*DECK,DUMPER
      SUBROUTINE DUMPER(XO,YO,ZO,TO,SIGXO,SIGYO,PMAS,PSIZ,RO,INCOMP,
     1ISOUT,IPOUT,MC3)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     SUBROUTINE DUMPER WRITES THE NBLK RECORDS -
C             XO,YO,ZO,TO,SIGXO,SIGYO,RO,PSIZ,PMAS
C     ONTO TAPE IPOUT, AND IF MC(3) IS NOT ZERO, ONTO TAPE ISOUT.
C
C ********************************************************************
C
      DIMENSION XOUT(100),YOUT(100),ZOUT(100),TOUT(100),ROUT(100)
      DIMENSION SYOT(100),SXOT(100),PSOT(100),PDEP(100)
      DATA N/0/, NBLK/100/
  807 FORMAT(5X,9E12.4)
  817 FORMAT( 1H0, 23X,  8HBLOCK OFI5, 52H TRANSPORTED PARCEL PROPERTIES
     1 WRITTEN ON IPOUT TAPE/ 12X, 2HXO, 10X, 2HYO, 10X, 2HZO, 10X,
     2 2HTO, 8X, 5HSIGXO, 7X, 5HSIGYO, 9X, 2HRO, 9X, 4HPSIZ, 8X,4HPMAS/)
 8023 FORMAT( 1H0, 14X, 59HRESUME PRE-TRANSPORT PARCEL PROPERTY LIST FOR
     1 PARTICLE SIZEE12.5, 7H METERS)
 8024 FORMAT( 2X,  4HNSEQ, 6X, 2HXP, 10X, 2HYP,  10X, 2HZP, 10X, 2HTP,
     1 9X, 4HPMAS, 8X, 4HRWAF, 7X, 4HZLOW, 8X, 4HDWAF/)
      IF(INCOMP.GT.0) GO TO 8063
      N = N + 1
      XOUT(N)=XO
      YOUT(N)=YO
      ZOUT(N)=ZO
      TOUT(N)=TO
      SXOT(N)=SIGXO
      SYOT(N)=SIGYO
      PSOT(N)=PSIZ
      PDEP(N)=PMAS
      ROUT(N)=RO
      IF(N.LT.NBLK) RETURN
COPY OUT BUFFER DATA VECTORS ONTO TAPE IPOUT IF THEY ARE FULL
 8063 WRITE(IPOUT) N
      IF( MC3 .GT. 1) WRITE(ISOUT,817) N
      IF(N.EQ.0) RETURN
      WRITE(IPOUT)     (XOUT(M),YOUT(M),ZOUT(M),TOUT(M),SXOT(M),SYOT(M),
     1ROUT(M),PSOT(M),PDEP(M),M=1,N)
      IF(MC3 .LE. 1) GO TO 8064
      WRITE(ISOUT,807) (XOUT(M),YOUT(M),ZOUT(M),TOUT(M),SXOT(M),SYOT(M),
     1ROUT(M),PSOT(M),PDEP(M),M=1,N)
      WRITE(ISOUT,8023) PSIZ
      WRITE(ISOUT,8024)
 8064 N=0
      RETURN
      END
```

```
*DECK,GETDA
      SUBROUTINE GETDA(ASUM,ZBH,KBHA,KBHB,NDATA,LTIM, ABAR ,KBHF,NDATF,
     1LTIMF)
C     MARCH, 1971
C     SUBROUTINE GETDA COMPUTES THE AVERAGED QUANTITY ABAR, WHICH MAY BE
C     A MEASURE OF HORIZONTAL ADVECTION, ROTATION OR DISPERSION, FROM
C     DATA STORED IN THE APPROPRIATE ARRAY ASUM.
C     ASUM  - 3-DIM. DATA ARRAY PREPARED IN SUBROUTINE SUMDAT.  EITHER
C             USUM,VSUM,DXSUM,DYSUM, OR RSUM.
C     ABAR  - WTD. AVG. OVER ARRAY  ASUM FROM INDICES KBHA-1 TO KBHB-1
C     KBHA  - INDEX OF UPPER STRATUM BASE-ALTITUDE ZBH
C     KBHB  - INDEX OF LOWER STRATUM BASE-ALTITUDE ZBH
C     NDATA - HORIZ. SPACE INDEX OF ARRAY ASUM
C     LTIM  - UPDATE TIME INDEX OF ARRAY ASUM
      COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
      DIMENSION ASUM(KBHF,NDATF,LTIMF),ZBH(KBHF)
      DATA PROGRM/6HGETDA /
CHECK IF KBHA-1 EXCEEDS KBHX
      IF(KBHA-KBHX-1) 3,2,1
    1 I=1
   10 CALL ERROR(PROGRM,I,ISOUT)
      ABAR=0.
      RETURN
    2 ABAR=ASUM(KBHA-1,NDATA,LTIM)
      RETURN
    3 ABAR=ASUM(KBHA-1,NDATA,LTIM)
CHECK IF KBHB IS LESS THAN 1
      IF(KBHB-1) 6,5,4
    6 I=6
      GO TO 10
CONCLUDE ABAR COMPUTATION
    4 ABAR=ABAR-ASUM(KBHB-1,NDATA,LTIM)
    5 ABAR=ABAR/(ZBH(KBHA)-ZBH(KBHB))
      RETURN
      END
```

```
*DECK,GETUP
      SUBROUTINE GETUP(NET,NETSU,MARY,MARF,ICF,JCF,NCF,NDATF)
C
C     MARCH, 1971
C
C
C     SUBROUTINE  GETUP  PREPARES THE HORIZONTAL SPACE CONTROL NET
C     ARRAYS  NET( IC, JC )  AND  NETSU ( NC ) FROM DATA PROVIDED BY THE
C     USER IN THE GRID SPECIFICATION ARRAY MARY( MARK ).
C
C     THE SUBSCRIPTS  IC  AND  JC  OF THE TWO-DIMENSIONAL ARRAY
C     NET( IC, JC )  LOCATE ( SYMBOLICALLY ) THE CENTERS OF CONTIGUOUS
C     UNIT MESH SQUARES ( OF DIMENSION  WINT ) RELATIVE TO THE UNIT
C     SQUARE IN THE SOUTH-WEST CORNER OF THE NET.   FOR THIS SOUTH-WEST
C     CORNER UNIT  MESH   IC = JC = 1.  IC  IS INCREMENTED IN THE
C     EASTERLY DIRECTION AND  JC  IS INCREMENTED IN THE NORTHERLY
C     DIRECTION.
C
C     ON FIRST PASS THROUGH THE ELEMENTS OF  MARY( MARK )  EACH POSITIVE
C     INTEGER FLAGS A PARTICULAR NON-SUBDIVIDED UNIT MESH SQUARE.  A 0
C     FLAGS A PARTICULAR SUBDIVIDED UNIT MESH SQUARE.
C     A UNIQUE VALUE OF NDATA ( THE ARRAY INDEX WHICH REFERENCES ALL OF
C     THE ATMOSPHERIC DATA ARRAY ELEMENTS ASSOCIATED WITH THIS UNIT
C     SQUARE ) IS STORED IN  NET( IC, JC ).
C
C     WHEN ZERO IS FOUND IN AN ELEMENT OF  MARY( MARK ) ,
C     NC  ( THE ARRAY INDEX WHICH REFERENCES A STARTING LOCATION IN THE
C     ARRAY  NETSU ( NC )  ) IS STORED IN  NET( IC, JC )  AS A NEGATIVE
C     INTEGER  -NC.
C
C     MARY( MARK )  IS ERASED AND RELOADED.  ON SECOND PASS THROUGH
C     THE ELEMENTS OF  MARY( MARK ), THE  ELEMENT  NC   OF THE ARRAY
C     NETSU ( NC )  WILL BE LOADED WITH CONTROL DATA PERTAINING TO THE
C     LOWER-LEFT QUADRANT OF THE SUBDIVIDED MESH SQUARE.  THE SUCCEEDING
C     THREE ELEMENTS ( NETSU ( NC+1 ), NETSU ( NC+2 ), NETSU ( NC+3 ) )
C     WILL BE LOADED WTTH CONTROL DATA PERTAINING TO THE OTHER THREE
C     QUADRANTS, PROCEEDING CLOCKWISE FROM THE FIRST QUADRANT.  THESE
C     CONTROL DATA WILL BE ADDITIONAL  NDATA  OR  NC  VALUES FLAGGED BY
C     MARY( MARK ).
C
C     PROCESSING CONTINUES UNTIL NO ADDITIONAL ELEMENTS  NC  ARE FLAGGED
C     BY  MARY( MARK ).
C
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
      COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      DIMENSION       NET(ICF,JCF),      NETSU(   NCF),       MARY(  MARF)
      DATA PROGRM/6HGETUP /
C
 1000 FORMAT( 36I2 )
 1001 FORMAT( 1H0, 25X, 31HARRAY MARY HAS BEEN LOADED WITH,I5, 22H ELEME
     1NT(S) AS FOLLOWS/)
 1002 FORMAT(25X,36I2)
C
      MSECT = 4
      MNEG = 1 - MSECT
      NDATA = 0
      IC = 0
      JC = 1
      IF(ICX.GT.ICF) CALL ERROR(PROGRM,-1,ISOUT)
      IF(JCX.GT.JCF) CALL ERROR(PROGRM,-1,ISOUT)
```

```
      MARX = ICX * JCX
1     DO 2 MARK = 1, MARF
2     MARY( MARK ) = -9
      IF(MARX.GT.MARF) CALL ERROR(PROGRM,-2,ISOUT)
      READ(ISIN,1000) (MARY(MARK),MARK=1,MARX)
      WRITE(ISOUT,1001) MARX
      WRITE(ISOUT,1002) (MARY(MARK),MARK=1,MARX)
      MARK = 0
      MCTR = 0
3     MARK = MARK + 1
      IF( MARK - MARX ) 5, 5, 4
4     MARX = MSECT * MCTR
      IF( MARX )  6, 14, 1
5     IF( MARY( MARK ) )  6, 7, 8
6     CALL ERROR(PROGRM,-6,ISOUT)
7     MNEG = MNEG + MSECT
      NQQ = - MNEG
      MCTR = MCTR + 1
      GO TO 9
8     NDATA = NDATA + 1
      NQQ = NDATA
      NDATX = NDATA
      IF(NDATX.GT.NDATF) CALL ERROR(PROGRM,-8,ISOUT)
9     IC = IC + 1
      IF( JC - JCX ) 10, 10, 13
10    IF( IC - ICX ) 12, 12, 11
11    JC = JC + 1
      IC = 0
      GO TO 9
12    NET( IC, JC ) = NQQ
      GO TO 3
13    NC = IC
      NETSU( NC ) = NQQ
      NCX = NC
      IF(NCX.GT.NCF) CALL ERROR(PROGRM,-13,ISOUT)
      GO TO 3
14    RETURN
      END
```

```
*DECK,LAYERS
      SUBROUTINE LAYERS(ZCH,ZBH,KBHF)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     CONSTRUCTS THE ATMOSPHERE STRATIFICATION ARRAYS ZBH AND ZCH FOR
C     THREE-DIMENSIONAL WIND AND TURBULENCE FIELDS.
C     ZBH CONTAINS STRATA BASE ALTITUDES AND ZCH CONTAINS STRATA CENTER
C     ALTITUDES (BOTH RELATIVE TO MEAN SEA LEVEL)(METERS)
C
C ***********************************************************************
C
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
       COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX
C
      INTEGER BASALT,CNTALT,TLAYR
      DIMENSION ZBH(KBHF),ZCH(KBHF), ENTRY(8)
      DATA PROGRM   ,BASALT   ,CNTALT   ,EPSZ     ,ALIMIT   ,IREC
     1    /6HLAYERS ,4HBASE   ,4HCENT   , 0.1     , 999999. , 8       /
C
    1 FORMAT( 10X,  6HLEVELS,I4, 5H THRU,I4/25X, 8F12.5)
    2 FORMAT(8F10.0)
    3 FORMAT(1H0, 48X, 25HWIND LAYER BASE ALTITUDES/)
    4 FORMAT(1H0, 43X, 27HWIND LAYER CENTER ALTITUDES/)
    5 FORMAT( 11XA4)
   6  FORMAT(1H0,25X,31HMAXIMUM WIND SPACE ALTITUDE IS E12.5,7H METERS)
   8  FORMAT(1H0,10X, 45HZBH(1)AND ZMIN DO NOT AGREE WITHIN TOLERANCE ,E
     112.5)
C
COPY IN DATA TYPE (LAYER BASE OR CENTER ALTITUDE) INDICATOR
      READ(ISIN,5)TLAYR
COPY WIND LAYER ALTITUDES INTO ARRAY ZCH
      K=0
  200 READ(ISIN,2)(ENTRY(I),I=1,IREC)
      DO 201 I=1,IREC
      IF(ENTRY(I).GE.ALIMIT) GO TO 202
      IF(ENTRY(I) .LT. 0.0) GO TO 201
      K=K+1
      IF(K.GT.KBHF) CALL ERROR(PROGRM,-201,ISOUT)
      ZCH(K)=ENTRY(I)
  201 CONTINUE
      GO TO 200
  202 KBHX=K
COMMINGLE THE LAYER ALTITUDES INTO ASCENDING ORDER
      KBHM1=KBHX-1
      DO 210 I=1,KBHM1
      IP1=I+1
      DO 210 J=IP1,KBHX
      IF(ZCH(I).LE.ZCH(J))GO TO 210
      TEMP=ZCH(I)
      ZCH(I)=ZCH(J)
      ZCH(J)=TEMP
 210  CONTINUE
COMPUTE LAYER CENTER OR BASE ALTITUDES DEPENDING ON WHICH WERE INPUT
      IF(TLAYR.EQ.CNTALT)GO TO 250
  230 IF(TLAYR.NE.BASALT)CALL ERROR(PROGRM,-230,ISOUT)
      IF(ABS(ZCH(1)-ZMIN).LE.EPSZ)GO TO 235
```

```
      WRITE(ISOUT,8)EPSZ
  234 CALL ERROR(PROGRM,-234,ISOUT)
  235 ZCH(1)=ZMIN
CONSTRUCT WIND LAYER CENTER ALTITUDES IN ARRAY ZCH AND LOAD BASE
C     ALTITUDES INTO ZBH
      DO 240 K=1,KBHM1
      ZBH(K)=ZCH(K)
  240 ZCH(K)= (ZCH(K) + ZCH(K+1))/2.0
      ZBH(KBHX)=ZCH(KBHX)
      ZCH(KBHX)= 2.0*ZBH(KBHX) - ZCH(KBHX-1)
      GO TO 300
CONSTRUCT WIND LAYER  BASE  ALTITUDES IN ARRAY ZBH
 250  ZBH(1)=ZMIN
      DO 260 I=2,KBHX
 260  ZBH(I)=2.0*ZCH(I-1) - ZBH(I-1)
 300  ZMAX=2.0*ZCH(KBHX)-ZBH(KBHX)
COPY OUT WIND LAYER DATA
      WRITE (ISOUT,6)ZMAX
      WRITE(ISOUT,3)
      DO 301 IGO=1,KBHX,IREC
      ISTOP=IGO+IREC-1
      IF(ISTOP.GT.KBHX) ISTOP=KBHX
  301 WRITE(ISOUT,1)IGO,ISTOP,(ZBH(K),K=IGO,ISTOP)
      WRITE(ISOUT,4)
      DO 303 IGO=1,KBHX,IREC
      ISTOP=IGO+IREC-1
      IF(ISTOP.GT.KBHX) ISTOP=KBHX
  303 WRITE(ISOUT,1)IGO,ISTOP,(ZCH(K),K=IGO,ISTOP)
      RETURN
      END
```

```
*DECK,NEST
      SUBROUTINE NEST(NET,NETSU,XQ,YQ,NDATA,XL,XR,YL,YU,ICF,JCF,NCF)
C     MARCH, 1971
C     GIVEN THE HORIZONTAL COORDINATES OF A POINT, NEST RETURNS THE
C     NET MESH OR SUB-MESH INDEX NDATA AND THE BOUNDARY COORDINATES OF
C     THE MESH OR SUB-MESH
C     MESH INDEX IS -999 IF INPUT POINT LIES OUTSIDE ATMOS.
C     NET   - PRIMARY HORIZONTAL SPACE RESOLUTION MESH ARRAY
C     NETSU - HORIZONTAL SPACE RESOLUTION SUB-MESH ARRAY
C     XQ    - INPUT POINT X COORDINATE
C     YQ    - INPUT POINT Y COORDINATE
C     NDATA - OUTPUT MESH OR SUB-MESH INDEX
C     XL    - OUTPUT MESH OR SUB-MESH  LEFT BOUNDARY X COORDINATE
C     XR    - OUTPUT MESH OR SUB-MESH RIGHT BOUNDARY X COORDINATE
C     YL    - OUTPUT MESH OR SUB-MESH LOWER BOUNDARY Y COORDINATE
C     YU    - OUTPUT MESH OR SUB-MESH UPPER BOUNDARY Y COORDINATE
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
       COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX
      DIMENSION NET(ICF,JCF),NETSU(NCF)
      DATA PROGRM/6HNEST  /
COMPUTE MESH INDICES IC AND JC FOR (XQ,YQ)
      IC=(XQ-XLLC)/WINT+1.
      JC=(YQ-YLLC)/WINT+1.
COMMENCE MESH SEARCH
CHECK IF IC (JC) LIES BETWEEN 1 AND ICX (JCX)
      IF((IC.GE.1).AND.(JC.GE.1).AND.(IC.LE.ICX).AND.(JC.LE.JCX))GO TO 1
CANCEL MESH SEARCH. (XQ,YQ) LIES OUTSIDE ATMOS.
      NDATA=-999
      RETURN
COMPUTE XL,XR,YL, AND YU FOR MESH
    1 VINT=WINT
      XL=VINT*FLOAT(IC-1)+XLLC
      XR=VINT*FLOAT(IC)+XLLC
      YL=VINT*FLOAT(JC-1)+YLLC
      YU=VINT*FLOAT(JC)+YLLC
CHECK SIGN OF NET(IC,JC)
      IF(NET(IC,JC)) 4,2,3
    2 CALL ERROR(PROGRM,-2,ISOUT)
CONCLUDE MESH SEARCH
    3 NDATA=NET(IC,JC)
      RETURN
COMMENCE QUADRANT SEARCH. OBTAIN POINTER NQ
    4 NQ=-NET(IC,JC)
COMPUTE QUADRANT INDICES IQ AND JQ FOR (XQ,YQ)
    5 VINT=VINT/2.
      IQ=(XQ-XL)/VINT
      JQ=(YQ-YL)/VINT
CONVERT NQ TO QUADRANT LABEL
      NQ=NQ+3*IQ+JQ-2*IQ*JQ
COMPUTE XL,XR,YL, AND YU FOR QUADRANT
      XR=XL+VINT*FLOAT(IQ+1)
      XL=XL+VINT*FLOAT(IQ)
      YU=YL+VINT*FLOAT(JQ+1)
      YL=YL+VINT*FLOAT(JQ)
CHECK SIGN OF NETSU(NQ)
      IF(NETSU(NQ)) 7,6,8
    6 CALL ERROR(PROGRM,-6,ISOUT)
CONTINUE QUADRANT SEARCH. OBTAIN POINTER NQ
    7 NQ=-NETSU(NQ)
```

```
      GO TO 5
CONCLUDE QUADRANT SEARCH
    8 NDATA=NETSU(NQ)
      RETURN
      END
```

```
*DECK,ONEDIN
      SUBROUTINE ONEDIN(ZCH,ZBH,CAVS,DX    ,DY    ,LTIM,KBHF,NDATF,LTIMF,
     1 FORM,SPEC)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     READS AND PROCESSES WIND/TURBULENCE DATA FOR A HORIZONTALLY
C     HOMOGENIOUS FIELD.  VERTICAL COMPONENTS ARE NOT CONSIDERED.
C
C ***********************************************************************
C
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
       COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX
C
      INTEGER WIND,TURB,METEOR,RESOLV,SPEC,FORM
      DIMENSION ZCH(KBHF),ZBH(KBHF),DX(KBHF,NDATF,LTIMF),CAVS(KBHF)
      DIMENSION FMT(12),SCALE(5), AP(3), DY(KBHF, NDATF, LTIMF)
C
      DATA ALIMIT  , RADC      , PROGRM  , METEOR ,RESOLV, WIND , TURB
     1  /  999999. ,.0174532925, 6HONEDIN, 4HMETE ,4HRESO,4HWIND,4HTURB/
      DATA IREC/8/
C
    1 FORMAT(  4X,  6HLEVELS,I4, 5H THRU,I4, 8F12.5)
    3 FORMAT( ////33X, 25HWIND LAYER BASE ALTITUDES/)
    4 FORMAT(1H03X31HMAXIMUM WIND SPACE ALTITUDE IS E12.5,7H METERS)
 1000 FORMAT (12A6)
 1100 FORMAT (8F10.0)
 1200 FORMAT (20I4)
 1300 FORMAT(       16X, 13HRAW WIND DATA,33X,19HPROCESSED WIND DATA//8X,
     11HZ, 9X, 10HVX OR DIR., 3X, 11HVY OR SPEED, 14X, 1HZ, 12X,
     2 2HVX, 12X, 2HVY/)
 1400 FORMAT (3(2X, 1PE12.5))
 1500 FORMAT (1H+ 47X, 3(2X, 1PE12.5))
 1600 FORMAT(  10X19HRAW TURBULENCE DATA,28X25HPROCESSED TURBULENCE DATA
     1//3X, 1HZ, 10X, 4HEPSX, 10X, 4HEPSY, 17X, 1HZ, 11X 4HEPSX, 10X,
     2 4HEPSY/)
 1700  FORMAT( 1H0, 5X, 63HNUMBER OF WIND OR TURBULENCE INPUT DATA INCON
     1SISTENT FOR UPDATEI4)
 1800 FORMAT( 1H0, 5X, 59HWIND OR TURBULENCE STRATA ALTITUDES INCONSISTE
     1NT FOR UPDATEI4)
C
CHECK FORM AND SPEC
      IF(SPEC .EQ. WIND  .AND.  FORM .EQ. METEOR) GO TO 25
   20 IF(SPEC .EQ. WIND  .AND.  FORM .NE. RESOLV)CALL ERROR(PROGRM,-20,
     1  ISOUT)
COPY IN FORMAT, SCALE & FIELD POINTERS
   25 READ (ISIN, 1000)FMT
```

```
      READ (ISIN, 1100) SCALE
      READ (ISIN, 1200) N1, N2, N3
      DO 50 I = 1,3
   50    IF(SCALE(I).EQ. 0.0) SCALE (I) = 1.0
      IF(FORM .EQ. METEOR) TRNS=SCALE(5)*SCALE(3) - 180.
      IF(MC(2) .NE. 1  .AND.  SPEC .EQ. WIND) WRITE(ISCUT,1300)
      IF(MC(2) .NE. 1  .ANC.  SPEC .EQ. TURB) WRITE(ISCUT,1600)
      KBH = 0
COPY IN, PRINT RAW DATA, TRANSLATE AND SCALE DATA, AND PRINT PROCESSED
C     DATA
  100 READ (ISIN, FMT) AP
      IF(AP(N1).GE.ALIMIT)GO TO 250
      IF(MC( 2 )  .NE. 1   ) WRITE(ISOUT, 1400)AP(N1), AP(N2), AP(N3)
      KBH = KBH + 1
      CAVS(KBH)= (AP(N1) + SCALE(4))*SCALE(1)
      IF(FORM.EQ.RESOLV) GO TO 150
      DX(KBH,1,LTIM)=AP(N3)*SCALE(2)*SIN(RADC*(AP(N2)*SCALE(3) + TRNS))
      DY(KBH,1,LTIM)=AP(N3)*SCALE(2)*COS(RADC*(AP(N2)*SCALE(3) + TRNS))
      GO TO 200
  150 DX(KBH,1,LTIM) = AP(N2)*SCALE(2)
      DY(KBH,1,LTIM) = AP(N3)*SCALE(2)
  200 IF(MC( 2).NE. 1)WRITE (ISOUT, 1500)CAVS(KBH), DX(KBH, 1, LTIM),
     1DY(KBH, 1, LTIM)
      GO TO 100
  250 IF(LTIM .EQ. 1) KBHX=KBH
CHECK IF THE NUMBER OF DATA VECTORS IS CONSISTENT
  251 IF(LTIM .EQ. 1  .OR. KBH .EQ. KBHX) GO TO 253
      WRITE(ISOUT,1700)LTIM
COMMINGLE DATA TO ARRANGE IT IN ORDER OF ASCENDING ALTITUDE
  253 KBHM1 = KBHX - 1
      DO 255 I=1,KBHM1
      IP1=I+1
      DO 255 J=IP1,KBHX
      IF(CAVS(I) .LE. CAVS(J)) GO TO 255
      TEMP=CAVS(I)
      CAVS(I)=CAVS(J)
      CAVS(J)=TEMP
      TEMP=DX(I,1,LTIM)
      DX(I,1,LTIM)=DX(J,1,LTIM)
      DX(J,1,LTIM)=TEMP
      TEMP=DY(I,1,LTIM)
      DY(I,1,LTIM)=DY(J,1,LTIM)
      DY(J,1,LTIM)=TEMP
  255 CONTINUE
      IF(LTIM .EQ. 1 .ANC. SPEC .EQ. WIND) GO TO 259
CHECK STRATA ALTITUDES AGAINST THOSE FOR THE LTIM=1 WIND DATA
      DO 258 I=1,KBHM1
      IF(CAVS(I) .GE. ZBH(I) .AND. CAVS(I) .LE. ZBH(I+1)) GO TO 258
      WRITE(ISOUT,1800)LTIM
      CALL ERROR(PROGRM,-258,ISOUT)
  258 CONTINUE
      RETURN
CONSTRUCT WIND LAYER  BASE  ALTITUDES IN ARRAY ZBH AND LOAD CENTER
C     ALTITUDES INTO ZCH
  259 ZBH(1) = ZMIN
      ZCH(1)=CAVS(1)
      DO 260 I=2,KBHX
      ZCH(I)=CAVS(I)
  260 ZBH(I)=2.0*ZCH(I-1) - ZBH(I-1)
      ZMAX=2.0*ZCH(KBHX)-ZBH(KBHX)
```

```
C     COPY OUT WIND LAYER BASE CATA                                       ONEDI111
      WRITE(ISOUT,3)                                                      ONEDI112
      DO 270 IGO=1,KBHX,IREC                                              ONEDI113
      ISTOP=IGO+IREC-1                                                    ONEDI114
      IF(ISTOP.GT.KBHX) ISTOP=KBHX                                        ONEDI115
  270 WRITE(ISOUT,1)IGO,ISTOP,(ZBH(K),K=IGO,ISTOP)                        ONEDI116
      WRITE(ISOUT,4)ZMAX                                                  ONEDI117
      RETURN                                                              ONEDI118
      END                                                                 ONEDI119
```

```
*DECK,SPRVS                                                               SPRVS  1
      SUBROUTINE SPRVS(NET,NETSU,ZBH,ZCH,TIMUP,USUM,VSUM,DXSUM,DYSUM,     SPRVS  2
     1RSUM,WFZ,CAVS,HDAV,TSUM,WAVG,ALT,ATP,PRS,RLH,RHC,ETA,               SPRVS  3
     2ICF,JCF,NCF,KBHF,NDATF,LTIMF,NATF)                                  SPRVS  4
C                                                                         SPRVS  5
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978       SPRVS  6
C                                                                         SPRVS  7
C ************************************************************************SPRVS  8
C                                                                         SPRVS  9
C     SUBROUTINE SPRVS SUPERVISES DIFFUSIVE TRANSPORT                     SPRVS 10
C     OF FALLOUT PARCELS LISTED ON TAPE JPARN.  PARCEL PARAMETERS ARE     SPRVS 11
C     STORED IN ARRAYS XPAR,YPAR,ZPAR,TPAR,PDAM,PSAM,RWFR,DWFR,ZLWF,VWFRSPRVS 12
C     ONLY ONE PARCEL IS TRANSPORTED AT A TIME. FOR THIS PARCEL ABOVE     SPRVS 13
C     ITEMS ARE STORED IN XP,YP,ZP,TP,PSIZ,PMAS,RWAF,DWAF,ZLOW,VWAF.      SPRVS 14
C     XPAR   - X COORDINATE OF PARCEL CENTER                              SPRVS 15
C     YPAR   - Y COORDINATE OF PARCEL CENTER                              SPRVS 16
C     ZPAR   - Z COORDINATE OF PARCEL CENTER                              SPRVS 17
C     TPAR   - TIME OF DEFINITION OF CLOUD PARCEL                         SPRVS 18
C     PDAM   - MIDPOINT OF PARCEL PARTICLE SIZE CLASS                     SPRVS 19
C     PSAM   - TOTAL MASS OF PARCEL                                       SPRVS 20
C     RWFR   - RADIUS OF PARCEL AT CENTER OF MASS                         SPRVS 21
C     DWFR   - PARCEL THICKNESS                                           SPRVS 22
C     ZLWF   - ALTITUDE OF PARCEL BASE                                    SPRVS 23
C     VWFR   - PARCEL VOLUME                                              SPRVS 24
C                                                                         SPRVS 25
C ************************************************************************SPRVS 26
C                                                                         SPRVS 27
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO                 SPRVS 28
       COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX                    SPRVS 29
      COMMON /PARCL/  CRCSS,DOWN,DWAF,EDDY,NDATP,PMAS,PSIZ,RHOP,RWAF,     SPRVS 30
     1 TP,XP,YP,ZLOW,ZP                                                   SPRVS 31
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX                       SPRVS 32
C                                                                         SPRVS 33
      DIMENSION ALT(NATF),ATP(NATF),PRS(NATF),RHC(NATF),ETA(NATF)         SPRVS 34
      DIMENSION NET(ICF,JCF),NETSU(NCF),ZBH(KBHF),ZCH(KBHF),HDAV(LTIMF)   SPRVS 35
      DIMENSION USUM(KBHF,NDATF,LTIMF),VSUM(KBHF,NDATF,LTIMF),CAVS(KBHF)  SPRVS 36
      DIMENSION DXSUM(KBHF,NDATF,LTIMF),DYSUM(KBHF,NDATF,LTIMF)           SPRVS 37
      DIMENSION WFZ(KBHF,NDATF,LTIMF),WAVG(KBHF,LTIMF),TIMUP(LTIMF)       SPRVS 38
      DIMENSION RSUM(KBHF,NDATF,LTIMF),TSUM(KBHF)                         SPRVS 39
      DIMENSION XPAR(100),YPAR(100),ZPAR(100),TPAR(100),PDAM(100)         SPRVS 40
      DIMENSION PSAM(100),RWFR(100),DWFR(100),ZLWF(100),VWFR(100)         SPRVS 41
C                                                                         SPRVS 42
      DATA PROGRM/6HSPRVS / ,JF/100/                                      SPRVS 43
C                                                                         SPRVS 44
 8015 FORMAT( 1H+, 102X, 8HAIRBORNE)                                      SPRVS 45
 8016 FORMAT( 1H , I4, 8E12.4)                                            SPRVS 46
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```
8017 FORMAT(1H0,5X, 86H* * * * * SHORT-CUT TRANSPORT IS CANCELLED BECAU
    1SE VERTICAL WIND IS NON-ZERO * * * * *//)
8019 FORMAT( 1H+, 102X,    9H IMPACTED)
8020 FORMAT( 1H+, 102X, 17HOUTSIDE WINDSPACE)
8021 FORMAT( 1H0, 36X, 21HPARTICLE DIAMETER IS E12.5, 7H METERS)
8022 FORMAT( 23X,   9HFALL RATEE12.5,23H METERS/SEC AT ALTITUDEE12.5,
    1  7H METERS/ 23X, 37HUPPER LIMIT ALTITUDE FOR IMPACTION ISE12.5,
    2  7H METERS)
8024 FORMAT( 2X,  4HNSEQ, 6X, 2HXP, 10X, 2HYP,  10X, 2HZP, 10X, 2HTP,
    1 9X, 4HPMAS, 8X, 4HRWAF, 8X, 4HZLOW, 8X, 4HDWAF/)
8025 FORMAT( 1H1, 38X, 31HPRE-TRANSPORT PARCEL PROPERTIES/)
C
COMPUTE TURBULENCE PARAMETER AVERAGED OVER ALL SPACE, HAV
      HAV=0.
      DO 40 L=1,LTIMX
   40 HAV=HAV + HDAV(L)
      HAV=HAV/LTIMX
CHOOSE STANDARD DEVIATION OF VERTICAL TURBULENCE
      SIGW=EDDY
      IF(MC(6) .GT. 0) SIGW=5.39*(HAV)**(1.0/3.0)
      MC3=MC( 3)
      IF(MC3 .GT. 0) WRITE(ISOUT,8025)
      NSEQ=0
      PSZBE=-2.0
      IF(MC( 4 ).NE.0) GO TO 47
CANCEL SHORT-CUT TRANSPORT IF VERTICAL WIND IS NON-ZERO
      DO 45 L=1,LTIMX
      DO 45 K=1,KBHX
      IF(WAVG(K,L).NE.0.0)GO TO 46
  45  CONTINUE
      GO TO 47
  46  MC( 4 )=1
      WRITE(ISOUT,8017)
  47  CONTINUE
COMPUTE OVERALL AVERAGE VERTICAL VELOCITY
      KBHM1=KBHX-1
      WAVGK=0.0
      DO 51 L=1,LTIMX
      DO 50 K=1,KBHM1
   50 WAVGK=WAVGK + WAVG(K,L)*(ZBH(K+1) - ZBH(K))
   51 WAVGK = WAVGK + WAVG(KBHX,L)*(ZMAX - ZBH(KBHX))
      WAVGK=WAVGK/(LTIMX*(ZMAX-ZMIN))
COMPUTE TIMEX MARGIN FACTOR FOR AIRBORNE TEST
      IF(NDATX-1)70,70,60
   60 SLOP=1.1
      GO TO 100
   70 SLOP=1.0
COPY IN PARCEL BLOCK COUNT
 100  READ(JPARN)NP
      IF(NP.LE.0) GO TO 806
      IF(NP.GT.JF) CALL ERROR(PROGRM,-100,ISOUT)
COPY IN A BLOCK OF INPUT PARCEL PARAMETERS
      READ(JPARN)   (XPAR(J),YPAR(J),ZPAR(J),TPAR(J),PCAM(J),PSAM(J),
     1RWFR(J),DWFR(J),ZLWF(J),VWFR(J),J=1,NP)
COMMENCE PROCESSING BLOCK OF INPUT PARCELS ONE AT A TIME
      DO 1000 J=1,NP
      NSEQ=NSEQ+1
      IF(NSEQ.LT.NSEQO) GO TO 1000
      XP=XPAR(J)
      YP=YPAR(J)
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```
      ZP=ZPAR(J)
      TP=TPAR(J)
      PSIZ=PDAM(J)
      PMAS=PSAM(J)
      RWAF=RWFR(J)/2.
      DWAF=DWFR(J)
      ZLOW=ZLWF(J)
      VWAF=VWFR(J)
CHECK FOR NEW PARTICLE SIZE CLASS
      IF(ABS((PSIZ-PSZBE)/PSIZ).LE.1.0E-10) GO TO 103
      IF( MC3 .GT. 0) WRITE(ISOUT,8021) PSIZ
COMPUTE MID-ATMOSPHERE FALL RATE FAV FOR NEW PARTICLE SIZE CLASS
      H=(ZMIN+ZMAX)/2.
      CALL TRPL(H,NAT,ALT,ATP,T)
      CALL TRPL(H,NAT,ALT,PRS,P)
      CALL TRPL(H,NAT,ALT,RHO,DEN)
      CALL TRPL(H,NAT,ALT,ETA,VIS)
      CALL SETTLE(PSIZ,RHOF,DEN,VIS,T,P,FAV,IACCR)
      FAV=FAV-WAVGK
COMPUTE TABLE OF PARTICLE SETTLING SPEEDS - AN ENTRY FOR EACH STRATUM
      DO 101 KKZ=1,KBHX
      CALL TRPL(ZCH(KKZ),NAT,ALT,ATP,T)
      CALL TRPL(ZCH(KKZ),NAT,ALT,PRS,P)
      CALL TRPL(ZCH(KKZ),NAT,ALT,RHO,DEN)
      CALL TRPL(ZCH(KKZ),NAT,ALT,ETA,VIS)
  101 CALL SETTLE(PSIZ,RHOF,DEN,VIS,T,P,CAVS(KKZ),IACCR)
COMPUTE INITIAL ALTITUDE FOR THIS PARTICLE SIZE ABOVE WHICH DEPOSITION
CANNOT OCCUR
      TMAX=TP
      DO 1001 IZ=1,KBHM1
      TMAX=TMAX + (ZBH(IZ+1) - ZBH(IZ))/(CAVS(IZ) - WAVGK)
      IF(TMAX.GT.SLOP*TIMEX  .OR.  TMAX .LT. 0.0 ) GO TO 1002
 1001 CONTINUE
      TMAX=TMAX + (ZMAX - ZBH(KBHX))/(CAVS(KBHX) - WAVGK)
      ZLIM=5.0E4
      IF(TMAX.GT.SLOP*TIMEX  .OR.  TMAX .LT. 0.0 ) ZLIM=ZMAX
      GO TO 1012
 1002 ZLIM=ZBH(IZ+1)
 1012 IF(TMAX .LT. 0.0) TMAX=TIMEX
 1003 IF( MC3 .LT. 1) GO TO 1004
      WRITE(ISOUT,8022) FAV,H,ZLIM
      WRITE(ISOUT,8024)
 1004 CONTINUE
      IF(MC( 4 ).NE.0) GO TO 1255
COMPUTE DEPOSITION TIME FROM THE BASE OF EACH STRATUM FOR USE BY THE
C     SHORT-CUT TRANSPORT METHOD
      TSUM(1)=0.0
      DO 1250 K=2,KBHX
 1250 TSUM(K)=TSUM(K-1)+(ZBH(K) - ZBH(K-1))/CAVS(K-1)
 1255 CONTINUE
COMPUTE CROSSING-TRAJECTORIES DIFFUSIVITY CORRECTIONS FOR NEW PARTICLE
C     SIZE CLASS.
      DOWN=(FAV*ELDY/SIGH)**2
      CROSS=1./SQRT(1.+4.*DOWN)
      DOWN=1./SQRT(1.+DOWN)
      PSZBE=PSIZ
  103 IF( MC3 .GT. 0)
     1WRITE(ISOUT,8016) NSEQ,XP,YP,ZP,TP,PMAS,RWAF,ZLOW,DWAF
CANCEL PROCESSING OF PARCEL IF IT HAS ALREADY IMPACTED
      IF (IFIX(DWAF).GT.0) GO TO 1200
```

```
      IF( MC3 .GT. 0) WRITE(ISOUT,8019)                                  SPRVS167
      CALL        DUMPER(XP,YP,ZP,TP, RWAF, RWAF, PMAS,FSIZ,0.,0.,      SPRVS168
     1ISOUT,IPOUT,MC3)                                                   SPRVS169
      GO TO 1000                                                         SPRVS170
C COMPUTE INDEX OF MESH OR SUB-MESH CONTAINING PARCEL CENTER             SPRVS171
 1200 CALL NEST(NET,NETSU,XP,YP,NDATP,XL,XR,YL,YU,ICF,JCF,NCF)          SPRVS172
C CANCEL PROCESSING OF PARCEL IF IT IS INPUT OUTSIDE ATMOS.             SPRVS173
      IF(NDATP.GT.0) GO TO 1260                                          SPRVS174
      IF( MC3 .GT. 0) WRITE(ISOUT,8020)                                  SPRVS175
      GO TO 1000                                                         SPRVS176
CANCEL PROCESSING OF PARCEL IF IT CANNOT REACH THE GROUND IN THE ALLOTEDSPRVS177
C     TIME                                                               SPRVS178
 1260 IF(ZLOW.LT.ZLIM) GO TO 1409                                        SPRVS179
      IF( MC3 .GT. 0) WRITE(ISOUT,8015)                                  SPRVS180
      GO TO 1000                                                         SPRVS181
 1409 CALL        ADVEC(NET,NETSU,ZBH,TIMUP,USUM,VSUM,DXSUM,DYSUM,RSUM,  SPRVS182
     1WFZ,TSUM,CAVS,ZCH,ALT,ATP,PRS,RHC,ETA,TMAX,                        SPRVS183
     2ICF,JCF,NCF,KBHF,NDATF,LTIMF,NATF)                                 SPRVS184
 1000 CONTINUE                                                           SPRVS185
      GO TO 100                                                          SPRVS186
COPY OUT BUFFER DATA VECTORS FOR DRY DEPOSIT INCREMENTS.  WAFER          SPRVS187
C     PROCESSING HAS BEEN COMPLETED                                      SPRVS188
  806 CALL        DUMPER(0.,0.,0.,0.,    0.,    0.,    0.,  0.,0.,999,   SPRVS189
     1ISOUT,IPOUT,MC3)                                                   SPRVS190
      CALL        DUMPER(0.,0.,0.,0.,    0.,    0.,    0.,  0.,0.,999,   SPRVS191
     1ISOUT,IPOUT,MC3)                                                   SPRVS192
      REWIND JPARN                                                       SPRVS193
       ENDFILE IPOUT                                                     SPRVS194
      REWIND IPOUT                                                       SPRVS195
      RETURN                                                             SPRVS196
      END                                                                SPRVS197
```

```
*DECK,SUMDAT
      SUBROUTINE SUMDAT(NET,NETSU,ZBH,ZCH,WAVG,HDAV,USUM,VSUM,RSUM,WFZ,
     1TIMUP,DXSUM,DYSUM,ICF,JCF,NCF,KBHF,NDATF,LTIMF)
C
C      H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     SUMS AND WEIGHTS WIND AND TURBULENCE DATA FROM ZMIN TO ZBH(KBHX)
C      FOR USE BY THE FAST TRANSPORT CALCULATIONS
C
C      AREA  - AREA OF HORIZ. SPACE NET
C      AREAN - AREA OF A PARTICULAR MESH
C
C ********************************************************************
C
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
       COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX
C
      DIMENSION RSUM(KBHF,NDATF,LTIMF),HDAV(LTIMF),WAVG(KBHF,LTIMF)
      DIMENSION NET(ICF,JCF),NETSU(NCF),ZCH(KBHF),TIMUP(LTIMF),ZBH(KBHF)
      DIMENSION DXSUM(KBHF,NDATF,LTIMF),DYSUM(KBHF,NDATF,LTIMF)
      DIMENSION USUM(KBHF,NDATF,LTIMF),VSUM(KBHF,NDATF,LTIMF)
      DIMENSION WFZ(KBHF,NDATF,LTIMF)
C
   1  FORMAT(1H0,  5X,  17HUPDATE TIME INDEXI3,  23H.  WIND GRID CELL IN
     1DEXI3, 38H WITH HORIZONTAL COORDINATES (X,Y) - (E12.5, 1H,, E12.5,
     2 8H) METERS/)
    2 FORMAT(  9X, 5HLAYER, 8X, 10HHORIZONTAL, 6X, 10HHORIZONTAL,
     1 7X,                  9HCROSSWIND, 7X, 8HDOWNWIND,6X10HHORIZONTAL/
     2 8X, 6HCENTER, 8X, 10HE.-W. WIND, 6X, 10HN.-S. WIND, 2(6X10HTURBUL
     3ENCE), 6X, 8HROTATION/ 8X, 8HALTITUDE, 4(7X9HCOMPONENT), 9X,
     4 5HANGLE)
    6 FORMAT(1H1, 40X, 21HWEIGHTED, SUMMED DATA//)
    8 FORMAT(/23X,    6HUPDATEI4,  6H  MESHI4, 32H  AVERAGE TURBULENCE PA
     1RAMETER =E12.5)
    9 FORMAT(1H1, 29X, 57HTHREE DIMENSIONAL WIND AND TURBULENCE DATA BEF
     1ORE SUMMING/)
   12 FORMAT(  9X, 5HLAYER, 8X, 10HHORIZONTAL, 6X, 10HHORIZONTAL,
     1 7X, 8HVERTICAL, 8X, 9HCROSSWIND, 7X, 8HDOWNWIND,7X10HHORIZONTAL/
     2 8X, 6HCENTER, 8X, 10HE.-W. WIND, 6X, 10HN.-S. WIND, 9X,4HWIND,3X,
     3 2(6X, 10HTURBULENCE), 7X, 8HROTATION/ 8X, 8HALTITUDE,
     4 5(7X, 9HCOMPONENT), 9X, 5HANGLE)
   13 FORMAT(6E16.4)
   14 FORMAT(7E16.4)
   15 FORMAT(1H0, 22X,  55HTURBULENCE PARAMETER AVERAGED OVER ALL SPACE
     1FOR UPDATEI4,3H ISE12.5)
   16 FORMAT(1H0,22X48HAVERAGE VERTICAL WIND COMPONENT FOR EACK LAYER -)
   17 FORMAT( 20X, 6(I5, F8.3, 1H,))
C
      IF(MC(2) .EQ. 1  .OR.  MC(1) .EQ. 0) GO TO 20
COPY OUT THREE DIMENSIONAL WIND AND TURBULENCE DATA BEFORE SUMMING
      WRITE(ISOUT,9)
      DO 50 L=1,LTIMX
      DO 50 N=1,NDATX
      CALL CNTR(NET,NETSU,N,XG,YG,ICF,JCF,NCF)
      WRITE(ISOUT,1)L,N,XG,YG
      WRITE(ISOUT,12)
      DO 50 K=1,KBHX
```

```
   50 WRITE(ISOUT,14) ZCH(K),USUM(K,N,L),VSUM(K,N,L),WFZ(K,N,L),
     1 DXSUM(K,N,L),DYSUM(K,N,L),RSUM(K,N,L)
CALCULATE THE WEIGHTED SUMS OVER ATMOS. STRATA AND REWRITE ARRAYS
C     USUM, VSUM, RSUM, DXSYM, DYSUM. ALSO COMPUTE HDAV AND WAVG.
   20 AREA=ICX*JCX*(WINT**2)
      IF(MC(2) .EQ. 2) WRITE(ISOUT,6)
      DO 922 L=1,LTIMX
      DO 1304 LK=1,KBHX
 1304 WAVG(LK,L)=0.0
      HDAV(L)=0.
      DO 921 N=1,NDATX
      IF(MC(2).NE.2) GO TO 915
      CALL CNTR(NET,NETSU,N,XG,YG,ICF,JCF,NCF)
      WRITE(ISOUT,1)L,N,XG,YG
      WRITE(ISOUT,2)
  915 ZSTEP=ZBH(2)-ZBH(1)
      USUM(1,N,L)=USUM(1,N,L)*ZSTEP
      VSUM(1,N,L)=VSUM(1,N,L)*ZSTEP
      RSUM(1,N,L)=RSUM(1,N,L)*ZSTEP
      DXSUM(1,N,L)=DXSUM(1,N,L)*ZSTEP
      DYSUM(1,N,L)=DYSUM(1,N,L)*ZSTEP
      HAV=     (DXSUM(1,N,L) + DYSUM(1,N,L))/2.0
      KBHM1=KBHX-1
      DO  920 K=2,KBHM1
      ZSTEP=ZBH(K+1) - ZBH(K)
      USUM(K,N,L)=USUM(K,N,L)*ZSTEP + USUM(K-1,N,L)
      VSUM(K,N,L)=VSUM(K,N,L)*ZSTEP + VSUM(K-1,N,L)
      RSUM(K,N,L)=RSUM(K,N,L)*ZSTEP + RSUM(K-1,N,L)
      HAV=HAV+(DXSUM(K,N,L) + DYSUM(K,N,L))*ZSTEP/2.0
      DXSUM(K,N,L)=DXSUM(K,N,L)*ZSTEP + DXSUM(K-1,N,L)
  920 DYSUM(K,N,L)=DYSUM(K,N,L)*ZSTEP + DYSUM(K-1,N,L)
      HAV = (HAV + (DXSUM(KBHX,N,L)+DYSUM(KBHX,N,L))*(ZMAX-ZBH(KBHX))/2.
     1  )/(ZMAX-ZMIN)
COPY OUT SUMMED DATA IF REQUESTED
      IF(MC(2).EQ.2)
     1WRITE(ISOUT,13)(ZCH(K),USUM(K,N,L),VSUM(K,N,L),DXSUM(K,N,L),
     2 DYSUM(K,N,L),RSUM(K,N,L),K=1,KBHX)
      IF(MC(2) .NE. 1  .AND.  MC(1) .EQ. 1) WRITE(ISOUT,8)L,N,HAV
      CALL CNTR(NET,NETSU,N,XG,YG,ICF,JCF,NCF)
      XQ=XG
      YQ=YG
      CALL        NEST(NET,NETSU,XQ,YQ,NDATQ,XL,XR,YL,YU,ICF,JCF,NCF)
      AREAN=(XR-XL)*(YU-YL)
      HDAV(L)= HDAV(L) + HAV*AREAN
      DO 9210 KL=1,KBHX
 9210 WAVG(KL,L)= WAVG(KL,L) + WFZ(KL,N,L)*AREAN
  921 CONTINUE
      HDAV(L)=HDAV(L)/AREA
      DO 9215 KL=1,KBHX
 9215 WAVG(KL,L)=WAVG(KL,L) / AREA
      IF(MC(2) .NE. 1) WRITE(ISOUT,15)L,HDAV(L)
      IF( MC(2) .EQ. 1  .OR.  MC(1) .EQ. 0) GO TO 922
      WRITE(ISOUT,16)
      DO 9922 KL=1,KBHX,6
      KLP5=KL+5
 9922 WRITE(ISOUT,17) (K, WAVG(K,L), K=KL,KLP5)
  922 CONTINUE
      RETURN
      END
```

```
*DECK,TRANP
      SUBROUTINE TRANP(NET,NETSU,ZBH,TIMUP,USUM,VSUM,DXSUM,DYSUM,RSUM,
     1WFZ,CAVS,TSUM,TMAX,XO,YO,ZO,TO,SIGXO,SIGYO,RO,NDATO,
     2ICF,JCF,NCF,KBHF,NDATF,LTIMF)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ********************************************************************
C
C     GIVEN COORDINATES AND SETTLING SPEEDS FOR A FALLOUT PARCEL, PLUS A
C     TRANSPORT TIME LIMIT, TRANP COMPUTES THE PARCEL COORDINATES AT
C     ITS DEPOSITION POINT OR AT THE POINT IT LEAVES THE WIND SPACE OR
C     AT THE POINT WHEN IT RUNS OUT OF TIME.
C
C
C     MODE  - COMPUTATION MODE SWITCH
C                 0 RAPID COMPUTATION (ALL THE WAY TO DEPOSITION USING
C                   WEIGHTED, AVERAGED WINDS)
C                 1 LAYERWISE COMPUTATION
C     TO    - TIME AFTER PARCEL ADVECTION
C     XO    - PARCEL CENTER X COORDINATE AFTER ADVECTION
C     YO    - PARCEL CENTER Y COORDINATE AFTER ADVECTION
C     ZO    - PARCEL CENTER Z COORDINATE AFTER ADVECTION
C     SIGXO - PARCEL DOWNWIND DISPERSION PARAMETER AFTER ADVECTION
C     SIGYO - PARCEL CROSSIND DISPERSION PARAMETER AFTER ADVECTION
C     NDATO - INDEX OF HORIZONTAL SPACE RESOLUTION NET MESH
C     RO    - WIND HEADING ORIENTATION ANGLE AFTER ADVECTION
C
C ********************************************************************
C
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
       COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /PARCL/  CROSS,DOWN,DWAF,EDDY,NDATP,PMAS,PSIZ,RHOP,RWAF,
     1 TP,XP,YP,ZLOW,ZP
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX
C
      DIMENSION NET(ICF,JCF),NETSU(NCF),ZBH(KBHF),USUM(KBHF,NDATF,LTIMF)
      DIMENSION VSUM(KBHF,NDATF,LTIMF),DXSUM(KBHF,NDATF,LTIMF)
      DIMENSION DYSUM(KBHF,NDATF,LTIMF),TIMUP(LTIMF),CAVS(KBHF)
      DIMENSION RSUM(KBHF,NDATF,LTIMF),WFZ(KBHF,NDATF,LTIMF),TSUM(KBHF)
C
      DATA PROGRM   , EPSILO   , EPSZ     , QBRT        , VARL
     1    /6HTRANP   , .0005    , 0.1      , .3333333333, 1.0E9    /
C
    2 FORMAT( 6H TIME=E12.4,  5H ALT=E12.4, 7H X-POS=E12.4, 7H Y-POS=E12
     1.4,    6H MESH=I4,   8H REACHED)
    3 FORMAT( 6H TIME=E12.4,  5H ALT=E12.4, 7H X-POS=E12.4, 7H Y-POS=E12
     1.4,    6H MESH=I4,   10H ATTEMPTED)
    4 FORMAT( 1H0, 38HPARCEL AT INITIAL POINT (XP,YP,ZP,TP) 4E12.4/
     1  31H REQUIRED CHANNELLING AT POINT 4E12.4)
C
      EPS=EPSILO*WINT
      EPST=EPSILO*TMAX
      XO=XP
      YO=YP
      ZO=ZP
      TO=TP
      SIGXO=0.
      SIGYO=0.
      RO=0.
```

```
      NDATO=NDATP
      NDTC1=0
      NDTO1=0
      KBHC1=0
      KBHO1=0
      LTIM=1
 1000 CONTINUE
      MODE=-1
      IF(MC(4) .NE. 0) MODE=MODE+1
   50 MODE=MODE+1
      IF(LTIMX.GT.1)CALL CALIB(TIMUP,LTIMX,TO,1,LTIM)
CLOSEST ZBH PLANE BELOW ZO, OR EQUAL TO ZO, IS FOUND
      CALL CALIB(ZBH,KBHX,ZO, 1,KBHO)
      IF(ZO-ZBH(KBHO).GT.EPSZ)KBHO=KBHO+1
  100 WBAR=-CAVS(KBHO-1)
      IF(MODE.EQ.0)GO TO 210
CONSIDER TRANSPORT BETWEEN ADJACENT ZBH PLANES
      WBAR=WBAR+WFZ(KBHO-1,NDATO,LTIM)
      IF(WBAR)206,110,206
C     WHEN NET SETTLING SPEED IS ZERO, SET THE TIME INCREMENT TO THE
C     TIME LEFT BEFORE THE NEXT UPDATE.
  110 TSEG=TIMEX-TO
      IF(LTIM.LT.LTIMX)TSEG=TIMUP(LTIM+1)-TO
      KBHC=KBHO
      KBHO=KBHC-1
      GO TO 300
CHECK IF KBHO ADJUSTMENT MUST BE MADE BECAUSE PARCEL IS RISING
  206 IF(WBAR.LT.0.0.OR.ABS(ZO-ZBH(KBHO)).GT.EPSZ)IF(WBAR)210,210,209
      KBHO=KBHO+1
      GO TO 100
CONCLUDE KBHO,KBHC SETTINGS FOR A RISING PARCEL
C     KBHO(KBHC)IS THE ZBH PLANE FROM WHICH (TOWARD WHICH) THE PARCEL
C     IS MOVING.
  209 IF(ZO-ZBH(KBHO).LT.-EPSZ)KBHO=KBHO-1
  210 KBHC=KBHO+IFIX(SIGN(1.0,WBAR))
      TSEG = (ZBH(KBHC)-ZO)/WBAR
       IF(MODE.NE.0 .OR. ABS(ZO-ZBH(KBHO)) .GT. EPSZ) GO TO 300
COMPUTE OVERALL SETTLING TIME AND AVERAGE SETTLING SPEED FROM ZO TO ZMIN
      TSEG=TSEG+TSUM(KBHC)
      WBAR=(ZMIN-ZO)/TSEG
      KBHC=1
  300 TC=TO+TSEG
CHECK IF A TIME BOUNDARY IS CROSSED
      IF(LTIM .EQ. LTIMX) IF(TIMEX-TC)301,350,350
      IF(TIMUP(LTIM+1)- TC) 305,350,350
CHANGE PARAMETERS TO LIMIT TRANSPORT TC OR LESS THAN THE TIME BOUNDARY
  301 TSEG=TIMEX-TO
      TLIM=TIMEX
      GO TO 306
  305 TSEG = TIMUP(LTIM+1)-TO
      TLIM=TIMUP(LTIM+1)
  306 IF(MODE .GT. 0  .OR.  KBHO-KBHC .EQ.1) GO TO 350
      CALL CALIB(TSUM,KBHX,TC-TLIM,-1,KBHC)
      IF(KBHO .GT. KBHC) GO TO 310
      KBHC=KBHC-1
      WBAR=-CAVS(KBHC)
      GO TO 350
  310 TSEG = TSUM(KBHO) - TSUM(KBHC)
      WBAR=(ZBH(KBHC)-ZO)/TSEG
COMPUTE AVERAGE HORIZONTAL VELOCITIES UBAR AND VBAR
```

```
  350 KBHA=KBHO
      KBHB=KBHC
      IF(WBAR.LT.0.0) GO TO 405
      KBHA=KBHC
      KBHB=KBHO
  405 CALL GETDA( USUM,ZBH,KBHA,KBHB,NDATO,LTIM, UBAR,KBHF,NDATF,LTIMF)
      CALL GETDA( VSUM,ZBH,KBHA,KBHB,NDATO,LTIM, VBAR,KBHF,NDATF,LTIMF)
  407 CONTINUE
C     COMPUTE AVERAGE HORIZONTAL DISPERSION AND WIND ORIENTATION ANGLE
      CALL GETDA(DXSUM,ZBH,KBHA,KBHB,NDATO,LTIM,DXBAR,KBHF,NDATF,LTIMF)
      CALL GETDA(DYSUM,ZBH,KBHA,KBHB,NDATO,LTIM,DYBAR,KBHF,NDATF,LTIMF)
      CALL GETDA( RSUM,ZBH,KBHA,KBHB,NDATO,LTIM, RBAR,KBHF,NDATF,LTIMF)
      RC=RO+RBAR
      SIGXC=SIGXO+DXBAR*TSEG
      SIGYC=SIGYO+DYBAR*TSEG
C     COMPUTE CURRENT POSITION AND TIME (XC,YC,ZC,TC)
      TC=TO+TSEG
      ZC=ZO+WBAR*TSEG
      XC=XO+UBAR*TSEG
      YC=YO+VBAR*TSEG
      CALL NEST(NET,NETSU,XC,YC,NDATC,XL,XR,YL,YU,ICF,JCF,NCF)
      IF(MC(5).EQ.1) WRITE(ISOUT,3) TC,ZC,XC,YC,NDATC
C     COMPARE CURRENT MESH INDEX NDATC WITH PREVIOUS MESH INDEX NDATO
      IF(NDATC.EQ.NDATO) GC TO 700
      IF (MODE.EQ.0) GO TO 50
C     COMPUTE INTERPOLATED POINT
      XT=XC
      YT=YC
      ZT=ZC
      CALL BOUN(NET,NETSU,XT,YT,XO,YO,XC,YC,ICF,JCF,NCF)
      ZC=SQRT(((XT-XC)**2+(YT-YC)**2)/((XT-XO)**2+(YT-YO)**2))
      ZC=ZT+ZC*(ZO-ZT)
      IF(ABS(WBAR).LE.1.0E-30) GO TO 510
      TSEG=(ZC-ZO)/WBAR
      GO TO 518
  510 IF(ABS(UBAR).LE.1.0E-30) GO TO 513
      TSEG=(XC-XO)/UBAR
      GO TO 518
  513 IF(ABS(VBAR).LE.1.0E-30) GO TO 516
      TSEG=(YC-YO)/VBAR
      GO TO 518
  516 CALL ERROR(PROGRM,516,ISOUT)
      RETURN
  518 CONTINUE
      RC=RO+RBAR
      SIGXC=SIGXO+DXBAR*TSEG
      SIGYC=SIGYO+DYBAR*TSEG
  521 TC=TO+TSEG
      CALL NEST(NET,NETSU,XC,YC,NDATC,XL,XR,YL,YU,ICF,JCF,NCF)
C     CHECK IF PARCEL CENTER POSITION IS OSCILLATING
      IF((KBHO1.NE.KBHO).OR.(KBHC1.NE.KBHC).OR.(NDTC1.NE.NDATC).OR.
     1(NDTO1.NE.NDATO)) GO TO 626
      IF(MC(5).EQ.1) WRITE(ISOUT,4) XP,YP,ZP,TP,XC,YC,ZC,TC
      CALL CNTR(NET,NETSU,NDATO,XG,YG,ICF,JCF,NCF)
      XQ=XG
      YQ=YG
      CALL NEST(NET,NETSU,XQ,YQ,NDATQ,XLO,XRO,YLO,YUO,ICF,JCF,NCF)
C     CLEAR STORED MESH AND STRATUM INDICES
      NDTC1=0
      NDTO1=0
```

```
      KBHC1=0
      KBHO1=0
CHANNEL WAFER CENTER POSITION ALONG APPRPRIATE CELL BOUNDARY
      SPE=2.*EPS
      IF((ABS(XLO-XR).GT.SPE).AND.(ABS(XRO-XL).GT.SPE)) GO TO 616
      UBAR=0.
      CALL GETOA( VSUM,ZBH,KBHA,KBHB,NDATO,LTIM,VBARC,KBHF,NDATF,LTIMF)
      IF(ABS(VBARC).LE.ABS(VBAR)) GO TO 407
      VBAR=VBARC
      NDATO=NDATC
      GO TO 407
 616  IF((ABS(YLO-YU).GT.SPE).AND.(ABS(YUO-YL).GT.SPE))
     1CALL ERROR(PROGRM,616,ISOUT)
      VBAR=C.
      CALL GETOA( USUM,ZBH,KBHA,KBHB,NDATO,LTIM,UBARC,KBHF,NDATF,LTIMF)
      IF(ABS(UBARC).LE.ABS(UBAR)) GO TO 407
      UBAR=UBARC
      NDATO=NDATC
      GO TO 407
COMMIT PREVIOUS AND CURRENT MESH AND STRATUM INDICES TO STORAGE
 626  NDTC1=NDATC
      NDTO1=NDATC
      KBHC1=KBHC
      KBHO1=KBHO
CONVERT XO,YO,ZO,TO,SIGXO,SIGYO, AND NDATO TO CURRENT VALUES
 700  ZO=ZC
      XO=XC
      YO=YC
      TO=TC
      NDATO=NDATC
      IF(MC(5).EQ.1) WRITE(ISOUT,2) TO,ZO,XO,YO,NDATO
      SIGXO=SIGXC
      SIGYO=SIGYC
      RO=RC
CHECK IF CURRENT POSITION IS OUTSIDE ATMOSPHERE
 708  IF(NDATO.LE.0) GO TO 720
C     IF DEPOSITION PLANE IS REACHED OR TRANSPORT TIME LIMIT IS EXCEEDED
C     EXIT FROM TRANP, OTHERWISE RETURN TO TOP
      IF ((   (ZO-ZMIN).LE.EPSZ).OR.(   (TIMEX-TO).LE.EPST)) GO TO 720
      GO TO 1000
COMPUTE HORIZ. DISPERSION
  720 R2=RWAF**2
      TRIP=TO-TP
      DSPRTX=SIGXO/TRIP
      SIGXO = ( R2**QBRT + 2.0 * DOWN * TRIP * DSPRTX**QBRT/3.0 ) ** 3
      IF( SIGXO .GT.    VARL ) SIGXO =     VARL * ( 2.0 * DOWN * TRIP *
     1  ( DSPRTX/   VARL )**QBRT + 3.0 * ( R2/   VARL )**QBRT - 2.0 )
      SIGXO = SQRT( SIGXO )
      DSPRTY = SIGYO/TRIP
      SIGYO = ( R2**QBRT + 2.0 * CROSS * TRIP * DSPRTY**QBRT/3.0 ) ** 3
      IF( SIGYO .GT.    VARL ) SIGYO =     VARL * ( 2.0 * CROSS * TRIP *
     1  ( DSPRTY/   VARL )**QBRT + 3.0 * ( R2/   VARL )**QBRT - 2.0 )
      SIGYO = SQRT( SIGYO )
      RETURN
      END
```

```
*DECK,TRIDIN
      SUBROUTINE TRIDIN(NET,NETSU,ZCH,VX    ,VY    ,VZ  ,LTIM,ICF,JCF,NCF,
     1KBHF,NDATF,LTIMF,FCRM,SPEC)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     THIS SUBROUTINE FORMS A HORIZONTALLY AND VERTICALLY VARIANT WIND
C     OR TURBULENCE FIELD.    INPUTS ARE -
C     ALPHA       A WEIGHTING FACTOR FOR THE VERTICAL DISTANCES
C     BETA        A WEIGHTING FACTOR FOR THE HORIZONTAL DISTANCES
C     FMT         OBJECT TIME FORMAT
C     NN          THE NUMBER OF NEAREST DATA VECTORS THAT THE USER WISHES
C                 TO BE USED IN COMPUTATIONS
C     N1,N2,ETC   INPUT DATA POINTERS
C     SCALE       FACTORS USED TO TRANSLATE AND SCALE THE INPUT DATA
C     ZS(J)       HEIGHT OF THE J-TH VRCTOR
C     XS(J)       WEST-EAST COORDINATE OF THE J-TH VECTOR
C     YS(J)       SOUTH-NORTH COORDINATE OF THE J-TH VECTOR
C     SX(J)       EASTWARD POINTING COMPONENT OF THE J-TH VECTOR
C     SY(J)       NORTHWARD POINTING COMPONENT OF THE J-TH VECTOR
C     SZ(J)       UPWARD POINTING COMPONENT OF THE J-TH VECTOR
C     THE VECTOR READING OPERATION IS TERMINATED WHEN ZS(J).GE.999999.
C
C     *********************** OTHER PARAMETERS *************************
C
C     BIG         AN ARBITRARILY LARGE NUMBER
C     DM          DISTANCE BETWEEN THE CURRENT GRID POINT AND THE MOST
C                 REMOTE OF THE NEAREST NN DATA POINTS
C     GIB         AN ARBITRARILY SMALL NUMBER
C     JTOPV       THE TOTAL NUMBER OF WIND DATA POINTS BEING USED
C     NAD(J)      INDICES OF DISTANCES BETWEEN THE CURRENT GRID POINT
C                 AND THE JTH DATA POINT
C     NADT        INDEX OF THE NAD THAT CONTAINS THE ADDRESS OF THE D2
C                 WHICH IS THE LARGEST OF NEAREST NN DATA POINTS
C     XG,YG,ZG    COORDINATES  OF A SPACE LATTICE CENTER POINT
C
C ***********************************************************************
C
      COMMON /CNTROL/ IPOUT,ISIN,ISOUT,JPARN,MC(20),NSEQO
       COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
C
      INTEGER WIND,TURB,METEOR,RESOLV,SPEC,FORM
      DIMENSION ZCH(KBHF),NET(ICF,JCF),NETSU(NCF),VX(KBHF,NDATF,LTIMF)
      DIMENSION VY(KBHF,NDATF,LTIMF),VZ(KBHF,NDATF,LTIMF)
      DIMENSION XS(200),YS(200),ZS(200),SX(200),SY(200),SZ(200)
      DIMENSION D2(200),NAD(200),SCALE( 8),AP(6),FMT(12)
C
      DATA ALIMIT   , RADC       , PROGRM  , METEOR ,RESOLV, WIND , TURB
     1 /   999999. ,.0174532925, 6HTRIDIN, 4HMETE  ,4HRESO,4HWIND,4HTURB/
      DATA  JTOPF , BIG      , GIB
     1      / 200   ,1.0E+37   , 1.0E-37  /
C
    1  FORMAT(/18X, 5HALPHA, 8X, 4HBETA, 14X, 2HNN/ 15X, 2E12.4, I12)
    3 FORMAT(8X,I8,6E16.4)
    4 FORMAT(/5X, 62HTHE DATA VECTOR AT EACH SPACE LATTICE CENTER IS COM
     1PUTED USINGI4,  7H OUT OFI4, 15H INPUT VECTORS./)
    8    FORMAT(20I4)
   10 FORMAT(8F10.0)
```

```
   11 FORMAT(12A6)
  17   FORMAT(2F10.0,   I4)
   20 FORMAT( //53X, 22HSCALED WIND DATA       / 11X, 5HINDEX, 11X,
     1 1HZ, 15X, 1HX, 15X, 1HY, 14X, 2HVX, 14X 2HVY, 14X, 2HVZ)
   21 FORMAT( //50X, 22HSCALED TURBULENCE DATA/ 11X, 5HINDEX, 11X,
     1 1HZ, 15X, 1HX, 15X, 1HY, 12X, 4HEPSX, 10X, 4HEPSY)
  24   FORMAT(// 78H NO VECTORS LIE WITHIN THE SPECIFIED WEIGHTING REGION
     1.  A RANDOM SELECTION OF ,I4, 30H VECTORS ARE EQUALLY WEIGHTED ,
     2/ 5X, 15H FOR GRID POINT,
     3      5X, 9H(X,Y,Z)=(, F12.3,1H,,F12.3,1H,,F12.3,1H))
   31 FORMAT( //50X, 22H   RAW WIND DATA       / 11X, 5HINDEX, 11X,
     1 1HZ, 15X, 1HX, 15X, 1HY, 10X, 10HVX OR CIR., 6X, 11HVY OR SPEED,
     2 9X, 2HVZ)
   32 FORMAT( //47X, 22H   RAW TURBULENCE DATA/ 11X, 5HINDEX, 11X,
     1 1HZ, 15X, 1HX, 15X, 1HY, 12X, 4HEPSX, 10X, 4HEPSY)
   33 FORMAT(8X,I8,5E16.4)
C
C ***********************************************************************
C
COPY IN CONTROL PARAMETERS
      READ(ISIN,17)ALPHA,BETA,NN
      ALFA2=ALPHA**2
      BETA2=BETA**2
      IF(NN .EQ. 0) NN=1
      READ(ISIN,11)FMT
      READ(ISIN,10) SCALE
      DO 9 I=1,3
    9 IF( SCALE(I) .EQ. 0.0 ) SCALE(I) = 1.0
      IF( SCALE( 6).EQ. 0.0 ) SCALE( 6)= 1.0
      WRITE(ISOUT,1) ALPHA,BETA,NN
      READ(ISIN,8)N1,N2,N3,N4,N5,N6
   13 IF(N1+N2+N3+N4+N5+N6 .LT. 21) CALL ERROR(PROGRM,-13,ISOUT)
      IF( FORM .EQ. METEOR) TRNS = SCALE(5)*SCALE(3) - 180.
      IF(MC(2) .NE. 1  .AND.  SPEC .EQ. WIND) WRITE(ISOUT,31)
      IF(MC(2) .NE. 1  .AND.  SPEC .EQ. TURB) WRITE(ISOUT,32)
      J=0
COPY IN ATMOSPHERE DATA VECTORS
  100 READ(ISIN,FMT)AP
      IF(AP(N1).GE. ALIMIT) GO TO 101
      J=J+1
COPY OUT RAW DATA
      IF(MC(2) .NE. 1  .AND.  SPEC .EQ. WIND) WRITE(ISOUT, 3)J,AP(N1),
     1 AP(N5),AP(N6),AP(N2),AP(N3),AP(N4)
      IF(MC(2) .NE. 1  .AND.  SPEC .EQ. TURB) WRITE(ISOUT,33)J,AP(N1),
     1 AP(N5),AP(N6),AP(N2),AP(N3)
      IF(J.GT.JTOPF) CALL ERROR(PROGRM,-100,ISOUT)
      ZS(J) = (AP(N1) + SCALE(4))*SCALE(1)
      XS(J) = (AP(N5) + SCALE(7))*SCALE(6)
      YS(J) = (AP(N6) + SCALE(8))*SCALE(6)
      SZ(J) = AP(N4) * SCALE( 2)
      IF( FORM .EQ. RESOLV  .OR.  SPEC .EQ. TURB ) GO TO 50
      SX(J) =AP(N3)*SCALE(2) * SIN( RADC*(AP(N2)*SCALE(3) + TRNS))
      SY(J) =AP(N3)*SCALE(2) * COS( RADC*(AP(N2)*SCALE(3) + TRNS))
      GO TO 100
   50 SX(J) = AP(N2) * SCALE(2)
      SY(J) = AP(N3) * SCALE(2)
      GO TO 100
  101 JTOPV=J
      IF(MC(2).EQ.1) GO TO 102
COPY OUT SCALED INPUT DATA
```

```
      IF(SPEC .EQ. WIND) WRITE( ISOUT,20)
      IF(SPEC .EQ. TURB) WRITE( ISOUT,21)
      IF(SPEC .EQ. WIND)WRITE(ISOUT, 3)(J,ZS(J),XS(J),YS(J),SX(J),SY(J),
     1 SZ(J),J=1,JTOPV)
      IF(SPEC .EQ. TURB)WRITE(ISOUT,33)(J,ZS(J),XS(J),YS(J),SX(J),SY(J)
     1 ,J=1,JTOPV)
  102 IF(NN.GT.JTOPV .OR. NN.LT. 0) NN=JTOPV
  115 IF(NN.LT.1) CALL ERRCR(PROGRM,-115,ISOUT)
      WRITE(ISOUT,4)NN,JTOPV
COMMENCE CALCULATION OF DATA VECTOR AT EACH SPACE LATTICE CENTER POINT
C     USING NN NEAREST INPUT VECTORS
      NN1=NN+1
COMMENCE LOOP ON LATTICE CENTER POINTS IN THE HORIZONTAL PLANE.
      DO 906 NDATA=1,NDATX
      CALL CNTR(NET.NETSU,NDATA,XG,YG,ICF,JCF,NCF)
COMMENCE LOOP ON ATMOSPHERIC STRATA.
      DO 905 KBH=1,KBHX
      ZG=ZCH(KBH)
      DO 203 J=1,JTOPV
C
C     SET ALL NAD(J) EQUAL TO J TO PROVIDE INDICES FOR THE FULL SET OF
C     DATA POINTS AND TO PROVIDE AN INITIAL SET OF -NEAREST- DATA POINTS
      NAD(J)=J
C
C     COMPUTE DISTANCES BETWEEN THE CURRENT LATTICE CENTER POINT
C     (XG,YG,ZG) AND EACH CF THE INPUT DATA VECTOR LOCATIONS.
C     EACH OF THE DATA VECTOR LOCATIONS
      TX=XS(J)-XG
      TY=YS(J)-YG
      TZ=ZS(J)-ZG
      CRESSZ=TZ*TZ
      CUTOFF=ALFA2-CRESSZ
      IF(CUTOFF.LE.0) GO TO 202
      CRESSZ=CUTOFF/(ALFA2+CRESSZ)
      CRESSR=TX*TX+TY*TY
      CUTOFF=BETA2-CRESSR
      IF(CUTOFF.LE.0) GO TO 202
      CRESSR=CUTOFF/(BETA2+CRESSR)
      CRESSZ=CRESSZ*CRESSR
      IF(CRESSZ.LE.GIB) GC TO 202
      D2(J)=1.0/CRESSZ
      GO TO 203
  202 D2(J)=BIG
 203  CONTINUE
C
C     SET NADT=1 TO BEGIN THE SORT PROCEDURE THAT SELECTS THE MOST
C     REMOTE OF THE SET OF -NEAREST- DATA POINTS.  NOTE THAT FOR THE 1ST
C     PASS ALL THE NN -NEAREST- POINTS ARE EQUALLY LIKELY TO BE THE MOST
C     REMOTE OF THE SET.
      NADT=1
C
C     FIND THE ADDRESS OF AND DISTANCE TO THE MOST REMOTE POINT OF THE
C     NN -NEAREST- POINTS (THE POINTS WHOSE ADDRESSES ARE GIVEN BY
C     NAD(1),NAD(NN).) STORE THAT MAXIMUM DISTANCE IN THE WORD DM AND
C     SET NADT SUCH THAT DM=D2(NAD(NADT)).
      KL=NAD(NADT)
      DM=D2(KL)
      DO 207 J=1,NN
      KL=NAD(J)
      IF(DM-D2(KL))208,207,207
```

```
 208  DM=D2(KL)
      NADT=J
 207  CONTINUE
C     AT THIS POINT, DM IS THE LARGEST D2(J) FOR J=NAD(J),NAD(NN)
C
      IF (NN1-JTOPV)2072,2072,2073
C
C2072 NOW SELECT BEST NN POINTS
C     SCAN THE SET D2(J),J=NAD(NN+1,JTOPV) UNTIL A D2(J) LESS THAN DM
C     IS FOUND.  IF ONE IS FOUND, SWITCH NAD(NADT) WITH THE SELECTED NAD
C     THEN RESET DM AND NADT TO INDICATE THE MOST REMOTE OF THE NEAREST
C     NN POINTS.  WHEN THE FULL SET D2(J),J=NAD(NN+1,JTOPV) HAS BEEN
C     SCANNED, THE SET OF NEAREST DATA POINTS HAS BEEN SELECTED.  ONLY
C     ONE SCAN IS REQUIRED.
 2072 DO 210 J=NN1,JTOPV
      KL=NAD(J)
      IF(DM-D2(KL))210,210,211
 211  NTEMP=NAD(J)
      NAD(J)=NAD(NADT)
      NAD(NADT)=NTEMP
C
C     NOW RESET DM AND NADT TO THE NEW MOST REMOTE POINT
      DM=D2(KL)
      DO 212 KKK=1,NN
      KL=NAD(KKK)
      IF(DM-D2(KL))213,212,212
 213  DM=D2(KL)
      NADT=KKK
C
C     DM AND NADT ARE SET WITH THE PARAMETERS OF THE MOST REMOTE OF
C     THE NEAREST NN POINTS
 212  CONTINUE
 210  CONTINUE
 2073 CONTINUE
C
C     THE NEAREST NN HAVE BEEN FOUND
C
C
C2080 COMPUTE AND SUM  THE WEIGHTING FACTORS
 2080 SUM=0.0
      DO 214 J=1,NN
      L=NAD(J)
      D2(L)=1.0/D2(L)
 214  SUM=SUM+D2(L)
      IF(SUM/FLOAT(NN) .LE. GI8) WRITE(ISOUT,24) NN,XG,YG,ZG
C
C     NOW COMPUTE VECTOR ESTIMATE AT LATTICE CENTER POINT.
C     COMPUTE STORAGE INDEX
C     COMPUTE AND STORE VECTOR ESTIMATE AT LATTICE CENTER POINT.
      VXKNL=0.0
      VYKNL=0.0
      VZKNL=0.0
      DO 216 J=1,NN
      L=NAD(J)
      VXKNL=VXKNL+SX(L)*D2(L)
      VYKNL=VYKNL+SY(L)*D2(L)
 216  VZKNL=VZKNL+SZ(L)*D2(L)
      VXKNL=VXKNL/SUM
      VYKNL=VYKNL/SUM
      VZKNL=VZKNL/SUM
```

```
 2090 VX(KBH,NDATA,LTIM) = VXKNL
      VY(KBH,NDATA,LTIM) = VYKNL
      IF(FORM .EQ. TURB) GO TO 905
      VZ(KBH,NDATA,LTIM) = VZKNL
 905  CONTINUE
 906  CONTINUE
      RETURN
      END
```

```
*DECK,WILKNS
      SUBROUTINE WILKNS (ZCH,DXSUM,DYSUM,CAVS,TIMUP,KBHF,NDATF,LTIMF,L)

C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C *******************************************************************
C
C  WILKINS FUNCTION (JAS 20, 473(1963)) IN THE FORM BELOW IS USED TO
C  COMPUTE TURBULENT KINETIC ENERGY DENSITY DISSIPATION RATE, EPS,
C
C     EPS=USTAR**3 / (0.35*(Z+Z0))
C
C  WHERE -
C     USTAR IS SURFACE LAYER FRICTION VELOCITY
C     Z0    IS SURFACE ROUGHNESS LENGTH
C     Z     IS ALTITUDE ABOVE GZ.
C
C  USTAR IS COMPUTED FROM SURFACE WIND SPEED (U), HEIGHT AT WHICH U IS
C  MEASURED (ZM, USUALLY ZM=10 METERS), ROUGHNESS LENGTH (Z0), AND
C  RECIPROCAL MONIN-OBUKHOV LENGTH (RL), VIA THE EQUATION
C
C     USTAR=0.35*U / (ALOG(ZM/Z0)+CHI)
C
C  WHERE CHI IS CALCULATED BY EXPRESSIONS GIVEN BY BARKER AND BAXTER,
C  JAS 14, 620(1975).
C
C  IF U, ZM, Z0, AND RL ARE NOT INPUT, THE EQUATION
C
C     EPS=0.03/Z     (M**2/SEC**3)
C
C  IS USED.
C
C *******************************************************************
C
      COMMON /CNTROL/ IPOLT,ISIN,ISOUT,JPARN,MC(20),NSEQO
       COMMON /INDEX/ ICX,JCX,KBHX,LTIMX,NAT,NCX,NDATX
      COMMON /SPACE/ WINT,XLLC,YLLC,ZMAX,ZMIN,TIMEX
      DIMENSION DXSUM(KBHF,NDATF,LTIMF),DYSUM(KBHF,NDATF,LTIMF)
      DIMENSION CAVS(KBHF),ZCH(KBHF),TIMUP(LTIMF)
C
      DATA PROGRM , VKK   , WILK   , ALIMIT
     1  /6HWILKNS , 0.35  , 0.03   , 999999./
C
 1000 FORMAT(4F10.0)
 5000 FORMAT(       19X, 1HK, 8X, 3HZCH, 12X, 5HDXSUM,10X, 5HDYSUM)
 5100 FORMAT( 15X, I5, 3(3X,E12.5))
 5200 FORMAT(    15X76HTURBULENCE PARAMETERS ARE CALCULATED BY WILKINS R
```

```
     1ECIPROCAL ALTITUDE FUNCTION/ 15X 10HFOR UPDATEI3,  4H AT E12.5,   WILKN 48
     2 8H SECONDS/)                                                     WILKN 49
 5300 FORMAT( 14X, 22HSURFACE WIND SPEED IS E12.5, 3X, 20H MEASURED AT HWILKN 50
     1EIGHT E12.5/ 14X, 17HROUGHNESS LENGTH=E12.5, 3X, 32HRECIPROCAL MONWILKN 51
     2IN-OBUKHOV LENGTH=E12.5, 3X, 11H(MKS UNITS)/                      WILKN 52
     3 14X, 32HSURFACE LAYER FRICTION VELOCITY=E12.5, 3X,  7H(M/SEC)/)  WILKN 53
 5900 FORMAT( 1H0,9X87HCANNOT COMPUTE TURBULENCE VIA WILKINS METHOD BECAWILKN 54
     1USE ZCH ARRAY HAS NOT BEEN CONSTRUCTED/ 10X, 53HCALCULATION CANNOTWILKN 55
     2 PROCEED UNLESS WIND DATA ARE INPUT//)                            WILKN 56
C                                                                       WILKN 57
CHECK IF ARRAY ZCH HAS BEEN CREATED                                     WILKN 58
      IF(ZCH(1) .NE. ALIMIT) IF(MC(2)-1)50,60,50                        WILKN 59
      WRITE(ISOUT,5900)                                                 WILKN 60
   25 CALL ERROR(PROGRM,-25,ISOUT)                                      WILKN 61
   50 WRITE(ISOUT,5200)L,TIMUP(L)                                       WILKN 62
C                                                                       WILKN 63
C  READ  DATA USED TO CALCULATE USTAR (MKS UNITS)                       WILKN 64
C                                                                       WILKN 65
   60 READ(ISIN,1000) U, ZM, Z0, RL                                     WILKN 66
      IF(Z0 .EQ. 0.0) GO TO 300                                         WILKN 67
      IF(RL .GE. 0.0) GO TO 100                                         WILKN 68
C                                                                       WILKN 69
C  COMPUTE CHI FOR AN UNSTABLE BOUNDARY LAYER                           WILKN 70
C                                                                       WILKN 71
      XI = (1.0 - 15.0*ZM*RL)**0.25                                     WILKN 72
      CHI = -ALOG((XI**2+1.0) * (XI+1.0)**2 /8.0) + 2.0*ATAN (XI)       WILKN 73
     1 - 1.570796327                                                    WILKN 74
      GO TO 200                                                         WILKN 75
  100 CONTINUE                                                          WILKN 76
C                                                                       WILKN 77
C  COMPUTE CHI FOR A NEUTRAL OR STABLE BOUNDARY LAYER                   WILKN 78
C                                                                       WILKN 79
      CHI = 4.7*ZM*RL                                                   WILKN 80
  200 CONTINUE                                                          WILKN 81
      USTAR = VKK*U /  (ALOG(ZM/Z0) + CHI)                              WILKN 82
      C = USTAR**3/VKK                                                  WILKN 83
      IF(MC(2) .NE. 1) WRITE(ISOUT,5300)U,ZM,Z0,RL,USTAR                WILKN 84
      GO TO 400                                                         WILKN 85
  300 C = WILK                                                          WILKN 86
  400 CONTINUE                                                          WILKN 87
C                                                                       WILKN 88
C  COMPUTE EPS AND STORE TEMPORARILY IN CAVS                            WILKN 89
C                                                                       WILKN 90
      ZGZ = ZMIN                                                        WILKN 91
      DO 500 K=1,KBHX                                                   WILKN 92
  500 CAVS(K) = C/(ZCH(K) - ZGZ + Z0)                                   WILKN 93
C                                                                       WILKN 94
C  LOAD DIFFUSION PARAMETER ARRAYS                                      WILKN 95
C                                                                       WILKN 96
      DO 600 N=1,NDATX                                                  WILKN 97
      DO 600 K=1,KBHX                                                   WILKN 98
      DXSUM(K,N,L) = CAVS(K)                                            WILKN 99
  600 DYSUM(K,N,L) = CAVS(K)                                            WILKN100
      IF(MC(2) .EQ. 1) RETURN                                           WILKN101
      WRITE( ISOUT, 5000)                                               WILKN102
      DO 700 K=1,KBHX                                                   WILKN103
  700 WRITE(ISOUT,5100) K, ZCH(K), DXSUM(K,1,L),DYSUM(K,1,L)            WILKN104
      RETURN                                                            WILKN105
      END                                                               WILKN106
```

```
*DECK,CALC                                                              CALC
      SUBROUTINE CALC(IP,OMAP,NMAP)                                     CALC
C                                                                       CALC
C     H.G.NORMENT     JUNE 25,1971                                      CALC
C                                                                       CALC
C ***********************************************************************CALC
C                                                                       CALC
C     THIS SUBROUTINE COMPUTES MAP CONTRIBUTIONS FOR INDIVIDUAL         CALC
C     FALLOUT PARCELS                                                   CALC
C                                                                       CALC
C******************************* GLOSSARY ******************************CALC
C                                                                       CALC
C     NOB          SMALLEST POSSIBLE Y INDEX OF A CONTRIBUTION ELLIPSE  CALC
C     NOL          SMALLEST POSSIBLE X INDEX OF A CONTRIBUTION ELLIPSE  CALC
C     NOR          LARGEST  POSSIBLE X INDEX OF A CONTRIBUTION ELLIPSE  CALC
C     NOT          LARGEST  POSSIBLE Y INDEX OF A CONTRIBUTION ELLIPSE  CALC
C     YREL         Y COORDINATE OF THE MAP POINT ROW CURRENTLY BEING    CALC
C                  CONSIDERED RELATIVE TO THE  PARCEL   Y COORDINATE    CALC
C     XREL         X COORDINATE OF THE MAP POINT     CURRENTLY BEING    CALC
C                  CONSIDERED RELATIVE TO THE  PARCEL   X COORDINATE    CALC
C     XL           LEFT BOUNDRY X COORDINATE  OF THE PARCEL             CALC
C                  CONTRIBUTION ELLIPSE IN THE YREL MAP ROW             CALC
C     XR           RIGHTBOUNDRY X COORDINATE  OF THE PARCEL             CALC
C                  CONTRIBUTION ELLIPSE IN THE YREL MAP ROW             CALC
C     NWX          NUMBER OF MAP POINTS SPANNED BY A PARCEL             CALC
C                  CONCENTRATION ELLIPSE IN A ROW                       CALC
C     VARX2        2.0*GAUSSIAN DISTBN. VARIANCE ALONG A AXIS           CALC
C     VARY2        2.0*GAUSSIAN DISTBN. VARIANCE ALONG B AXIS           CALC
C     F            MAGNITUDE(I.E. INTEGRATED VALUE) OF A PARCEL         CALC
C                  PROPERTY  TO BE DISTRIBUTED ON THE MAP               CALC
C                                                                       CALC
C     ALSO SEE OPM1  GLOSSARY  AND PCHECK GLOSSARY                      CALC
C                                                                       CALC
C ***********************************************************************CALC
C                                                                       CALC
      COMMON /CONDAT/        IC(20)      ,IHOB       ,IPNCH      ,IPOUT      ,CALC
     1ISIN       ,ISOUT      ,JPOUT      ,KPOUT      ,KTAPE      ,LTAPE      ,CALC
     2MAPRAY     ,MBTAPE     ,MXREQ      ,SD         ,INPAP                   CALC
      COMMON /MAPDAT/ CAYF  ,CUTMAP      ,DGX        ,DGY        ,IH   ,IV   ,CALC
     1JC         ,NXMAP      ,NYMAP      ,NZ         ,OCUT       ,SSAM       ,CALC
     2TGZ        ,XGZ        ,X1         ,X2         ,YGZ        ,XMAX       ,CALC
     3XMIN       ,YMAX       ,YMIN       ,ZMIN                                CALC
      COMMON /PARDAT/        ASQ         ,BSQ        ,COSA       ,F          ,CALC
     1GAMA       ,KTR(100)   ,PMAS(100)  ,PSIZ(100)  ,RO(100)    ,SIGXO(100),CALC
     2SIGYO(100),SINA        ,TPAR(100)  ,XPAR(100)  ,YPAR(100)  ,YPRML      ,CALC
     3YPRMU      ,ZPAR(100)                                                   CALC
      COMMON /RUNDAT/        C           ,CF6        ,FSUM       ,ICTR       ,CALC
     1MAPRUN     ,NE         ,NIJ        ,NORD       ,NREC       ,NTASK      ,CALC
     2OPMID(12)  ,T1         ,T2         ,WFMAS(200)                          CALC
      DIMENSION OMAP(NMAP)                                              CALC
      DATA PROGRM/6HCALC  /                                             CALC
C                                                                       CALC
C     INITIALIZE FOR THIS PARCEL                                        CALC
C                                                                       CALC
      VARX2= ASQ/GAMA                                                   CALC
      VARY2= BSQ/GAMA                                                   CALC
      A = SINA*COSA*(1.0/VARY2- 1.0/VARX2)*2.0                          CALC
      B = 4.0/VARX2/VARY2                                               CALC
      CC= (COSA**2/VARX2 + SINA**2/VARY2)*2.0                           CALC
      D = 2.0*GAMA*CC                                                   CALC
```

```
      Q = F/SIGXO(IP)/SIGYC(IP)/6.28318531
C
C     COMPUTE SMALLEST Y INDEX OF A CONTRIBUTION
C
      NOB = (YPRML - YMIN)/DGY
      NOB=NOB+1
      IF(NOB.LT.1) NOB=1
  100 IF(NOB.LE.NYMAP) GO TO 120
  110 IRROR=-110
      GO TO 400
C
C     COMPUTE LARGEST  Y INDEX OF A CONTRIBUTION
C
  120 NOT = (YPRMU - YMIN)/DGY
      IF(NOT.GT.NYMAP) NOT=NYMAP
      IF(NOT.GT.0 ) GO TO 140
  130 IRROR=-130
      GO TO 400
C
C     ENTER THE MAP ROW LOOP
C
  140 DO 350 J=NOB,NOT
C
C     COMPUTE  THE LIMITING X COORDINATES OF THE PARCEL CONTRIBUTION
C     ELLIPSE IN THIS ROW
C
      YREL = J
      YREL = YMIN + DGY*YREL - YPAR(IP)
      RADIC = -B*YREL**2+D
      IF(RADIC.GE.0.0) GO TO 160
  150 RADIC=0.0
      CALL ERROR(PROGRM,  150,ISOUT)
  160 RADIC=SQRT(RADIC)
      XL=XPAR(IP)+ (YREL*A- RADIC)/CC
      XR = XL + 2.0*RADIC/CC
C
C     COMPUTE SMALLEST X INDEX OF A CONTRIBUTION
C
      NOL = (XL-X1)/DGX
      NOL=NOL+1
      IF(NOL.LT.1) NOL=1
      IF(NOL.GT.NXMAP) GO TO 350
C
C     COMPUTE LARGEST  X INDEX OF A CONTRIBUTION
C
  180 NOR = (XR-X1)/DGX
      IF(NOR.GT.NXMAP) NOR=NXMAP
      IF(NOR.LT.1) GO TO 350
  200 NWX = NOR - NOL
      IF(NWX+1)210,350,220
  210 IRROR=-210
      GO TO 400
C
C     COMPUTE OMAP(M) ARRAY INDEX EXTREMES FOR MAP POINTS IN THIS ROW
C
  220 MCRMT=(J-1)*NXMAP
      K = NOL + MCRMT
      L = K + NWX
C
C     ADJUST OR ADD CONTRIBUTIONS TO THE MAP POINTS
```

```
C
      GO TO (224,224,221,221,222,222),NORD
  221 OMA=TPAR(IP)
      GO TO 224
  222 OMA=PSIZ(IP)*1.0E6
  224 DO 300 M=K,L
      GO TO (225,245,230,240,230,240),NORD
  225 OMAP(M)=OMAP(M)+1.C
      GO TO 300
  230 OMAP(M) = AMIN1(OMA,OMAP(M))
      GO TO 300
  240 OMAP(M) = AMAX1(OMA,OMAP(M))
      GO TO 300
  245 XREL=M    -MCRNT
      XREL = X1    + DGX*XREL - XPAR(IP)
      OMA = Q*EXP( - (XREL*COSA + YREL*SINA)**2/VARX2 - (YREL*COSA
     1 - XREL*SINA)**2/VARY2)
  250 OMAP(M) = OMAP(M) + CMA
  300 CONTINUE
  350 CONTINUE
      RETURN
  400 CALL ERROR(PROGRM,IRROR,ISOUT)
      END
```

```
*DECK,CONTOR
      SUBROUTINE CONTOR( CCNTUR, CROLBL ,OMAP ,NMAP)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - JANUARY 1979
C
C ********************************************************************
C
C     DETERMINE UNORDERED SETS OF POINTS ( A MAXIMUM CF 300 IS ALLOWED)
C     THAT LIE ON THE CONTOURS SPECIFIED BY ARRAY CONTUR.   LINEAR
C     INTERPOLATION BETWEEN MAP POINTS IS USED.   SR SRTCNT IS CALLED TO
C     ORDER THE POINTS IN SEQUENCE AROUND THE CLOSED SECTIONS OF THE
C     CONTOURS.
C
C ********************************************************************
C
      COMMON /CONTAT/        IC(20)      ,IHOB       ,IPNCH      ,IPOUT      ,
     1ISIN       ,ISOUT      ,JPOUT      ,KPOUT      ,KTAPE      ,LTAPE      ,
     2MARRAY     ,MBTAPE     ,MXREQ      ,SD         ,INPAM
      COMMON /MAPDAT/ CAYF ,CUTMAP     ,DGX        ,DGY        ,IH   ,IV   ,
     1JC         ,NXMAP      ,NYMAP      ,NZ         ,GCUT       ,SSAM       ,
     2TGZ        ,XGZ        ,X1         ,X2         ,YGZ        ,XMAX       ,
     3XMIN       ,YMAX       ,YMIN       ,ZMIN
      DIMENSION OMAP(NMAP),CONTUR( 8),X(300),Y(300)
      DATA PROGRM/6HCONTOR/
C
      DO 990 L=1,8
      IF( CONTUR(L) .EQ. 0.0) GO TO 999
      CNT = CONTUR(L)
      K = 0
COMPUTE CONTOUR INTERSECTIONS ALONG MAP ROWS
      DO 400 I=1,NYMAP
      DO 400 J=2,NXMAP
```

```
      IF(OMAP(NXMAP*(I-1)+J-1) .LE. CNT) IF(OMAP(NXMAP*(I-1)+J) - CNT)
     1  400,200,200
      IF(OMAP(NXMAP*(I-1)+J) .GT. CNT) GO TO 400
  200 K = K + 1
      IF( K .GT. 300) CALL ERROR(PROGRM, -200, ISOUT)
      Y(K) = YMIN + I*DGY
      X(K) = XMIN + (J-1)*DGX + (CNT - OMAP(NXMAP*(I-1)+J-1))*DGX/
     1 (OMAP(NXMAP*(I-1)+J) - OMAP(NXMAP*(I-1)+J-1))
  400 CONTINUE
COMPUTE CONTOUR INTERSECTIONS ALONG MAP COLUMNS
      DO 900 J=1,NXMAP
      DO 900 I=2,NYMAP
      IF(OMAP(NXMAP*(I-2)+J) .LE. CNT) IF(OMAP(NXMAP*(I-1)+J) - CNT)
     1  900,700,700
      IF(OMAP(NXMAP*(I-1)+J) .GT. CNT) GO TO 900
  700 K = K + 1
      IF( K .GT. 300) CALL ERROR(PROGRM, -700, ISOUT)
      X(K) = XMIN + J*DGX
      Y(K) = YMIN + (I-1)*DGY + (CNT - OMAP(NXMAP*(I-2)+J))*DGY/
     1  (OMAP(NXMAP*(I-1)+J) - OMAP(NXMAP*(I-2)+J))
  900 CONTINUE
      DO 950 I=1,K
  950 WRITE(ISOUT,1000) X(I),Y(I), CNT
 1000 FORMAT( 3F10.0)
      CALL SRTCNT( X, Y, CNT, K, CRDLBL)
  990 CONTINUE
  999 RETURN
      END
```

```
*DECK,GOGO
      SUBROUTINE GOGO(OMAP,NMAP)
C
C     H.G.NORMENT      JUNE 28,1971
C
C *********************************************************************
C
C     THIS SUBROUTINE, WHICH IS CALLED BY OPM2 , CONTROLS  READ-IN OF
C     PARCEL DATA.  IT ROUTS PROCESSING OF THE DATA, AND CONTROLS
C     LOADING OF THE DATA ON TO TEMPORY STORAGE TAPE.
C
C******************************** GLOSSARY ****************************
C
C     ICTR          A CONTROL PARAMETER - WHEN ICTR.NE.NZ , ANOTHER
C                   MAP CORE LOAD IS SIGNALED TO FOLLOW
C     NIJ           A BLOCK COUNT OF DATA STORED ON TAPE AND/OR IN CORE
C     NZ            NUMBER OF MAP CORE LOADS REQUIRED BEYOND THE FIRST
C
C     ALSO SEE OPM1 GLOSSARY
C
C *********************************************************************
C
      COMMON /CONDAT/       IC(20)      ,IHOB       ,IPNCH      ,IPOUT     ,
     1ISIN       ,ISOUT      ,JPOUT      ,KPOUT      ,KTAPE      ,LTAPE     ,
     2MARRAY     ,MBTAPE     ,MXREQ      ,SD         ,INFAM
      COMMON /MAPDAT/ CAYF  ,CUTMAP     ,DGX        ,DGY        ,IH   ,IV  ,
     1JC         ,NXMAP      ,NYMAP      ,NZ         ,OCUT       ,SSAM      ,
```

```
     2TGZ        ,XGZ        ,X1         ,X2         ,YGZ        ,XMAX       ,GOGO
     3XMIN       ,YMAX       ,YMIN       ,ZMIN                               GOGO
      COMMON /PARDAT/         ASQ        ,BSQ        ,COSA       ,F          ,GOGO
     1GAMA       ,KTR(100)   ,PMAS(100)  ,PSIZ(100)  ,RO(100)    ,SIGXO(100),GOGO
     2SIGYO(100),SINA        ,TPAR(100)  ,XPAR(100)  ,YPAR(100)  ,YPRML      ,GOGO
     3YPRMU      ,ZPAR(100)                                                  GOGO
      COMMON /RUNDAT/        C           ,CF6        ,FSUM       ,ICTR       ,GOGO
     1MAPRUN     ,NE         ,NIJ        ,NORD       ,NREG       ,NTASK      ,GOGO
     2OPMID(12)  ,T1         ,T2         ,WFMAS(200)                         GOGO
      DIMENSION OMAP(NMAP)                                                   GOGO
      DATA PROGRM/6HGOGO  /                                                  GOGO
C                                                                            GOGO
      IJIN=1                                                                 GOGO
C     READ A DATA BLOCK COUNT                                                GOGO
C                                                                            GOGO
  100 READ(KTAPE)NIJ                                                         GOGO
C                                                                            GOGO
C     ARE WE FINISHED PROCESSING THE DATA-                                   GOGO
C                                                                            GOGO
      IF(NIJ.EQ.0) GO TO 400                                                 GOGO
      IF(NIJ.LE.MARRAY) GO TO 200                                            GOGO
  150 IRROR=-150                                                             GOGO
  160 CALL ERROR(PROGRM,IRROR,ISOUT)                                         GOGO
C                                                                            GOGO
C     READ A BLOCK OF PARCEL DATA                                            GOGO
C                                                                            GOGO
  200 READ(KTAPE)(XPAR(I),YPAR(I),ZPAR(I),TPAR(I),SIGXO(I),SIGYO(I),         GOGO
     1 RO(I),PSIZ(I),PMAS(I),I=1,NIJ)                                        GOGO
C                                                                            GOGO
C     CALL PCHECK TO BEGIN PROCESSING THE PARTICLE DATA INTO A MAP           GOGO
C                                                                            GOGO
      CALL PCHECK(IJIN,OMAP,NMAP)                                            GOGO
      IF(NZ.EQ.ICTR) GO TO 100                                               GOGO
C                                                                            GOGO
C     CALL POMP  TO DUMP PARTICLE DATA ON TO TAPE FOR USE IN SUBSEQUENT      GOGO
C     MAP CORE LOADS                                                         GOGO
C                                                                            GOGO
      IF(NIJ .GT. NE) CALL POMP                                              GOGO
      GOTO 100                                                               GOGO
  400 RETURN                                                                 GOGO
      END                                                                    GOGO
```

```
*DECK,MAP
      SUBROUTINE MAP(OMAP,NMAP)
C
C     T. W. SCHWENKE  26 FEBRUARY 1967
C     MODIFIED 1 FEBRUARY 1979 BY H. G. NORMENT
C
C ***********************************************************************
C
C     DELFIC MAP PRINTER
C
C ***********************************************************************
C
      COMMON /CONDAT/        IC(20)     ,IHOB       ,IPNCH      ,IPOUT     ,
     1ISIN       ,ISOUT      ,JPOUT     ,KPOUT      ,KTAPE      ,LTAPE     ,
     2MARRAY     ,MBTAPE     ,MXREQ     ,SD         ,INFAM
      COMMON /MAPDAT/ CAYF ,CUTMAP     ,DGX        ,DGY        ,IH   ,IV   ,
     1JC         ,NXMAP      ,NYMAP     ,NZ         ,GOUT       ,SSAM      ,
     2TGZ        ,XGZ        ,X1        ,X2         ,YGZ        ,XMAX      ,
     3XMIN       ,YMAX       ,YMIN      ,ZMIN
      COMMON /RUNDAT/        C          ,CF6        ,FSUM       ,ICTR      ,
     1MAPRUN     ,NE         ,NIJ       ,NORD       ,NREQ       ,NTASK     ,
     2OPMID(12) ,T1          ,T2        ,WFMAS(200)
      COMMON /OUTPUT/ FISNUM,FP(200),FW,NDSTR,JGC,MASCHN,PS(200),
     1 FMASS(200),DIAM(200)
      DIMENSION JMAP(20) ,OMAP(NMAP)
      INTEGER BLANK
      DIMENSION FMTEXP(21),FMTRUT(21),ABSSA(10)
      DATA FMTEXP(1),FMTRUT(1),FMTEXP(21),FMTRUT(21),BLANK,FMTA,FMTF,
     1    FMTI/6H(/1X, ,6H(5X,  ,6H)      ,6H)      ,6H       ,6HA6    ,
     2    6HF6.3  ,6HI6     /,DOT/6H   .   /
C
      DATA BITLUM,INC,LREW/ 6HMULTIB,19,0/
C
  1   FORMAT(1H1,5HSTRIPI3,5X, 12A6, 5X, 8HMAP TYPEI3)
  2   FORMAT(/12X,19I6)
  3   FORMAT(1H+, 32X, 17HTWO-LINE E FORMAT)
  4   FORMAT(1X,F13.0,2X,19F6.3)
  5   FORMAT(1H+, 32X, 21HTWO-LINE F11.3 FORMAT)
  6   FORMAT(16H0DISPLAY METHOD I4,33H IS NOT AVAILABLE. USED METHOD 1.)
  7   FORMAT(//15X, 18HTHIS MAP USES THE )
  8   FORMAT(//15X,25HTHE QUANTITY PRESENTED IS)
  9   FORMAT(15X,43HA COUNT OF CONTRIBUTING DEPOSIT INCREMENTS.)
 10   FORMAT(15X,42HEXPOSURE RATE NORMALIZED TO TIME H+1 HOUR.)
 11   FORMAT(15X,24HEXPOSURE RATE AT TIME H+F10.1,9H SECONDS.)
 12   FORMAT(15X,36HEXPOSURE ACCUMULATED BETWEEN TIME H+F10.1,22H SECOND
     1S AND INFINITY.)
 13   FORMAT(15X,36HEXPOSURE ACCUMULATED BETWEEN TIME H+F10.1,12H AND TI
     1ME H+F10.1,9H SECONDS.)
 14   FORMAT(15X,60HTOTAL MASS PER UNIT AREA OF CONTRIBUTING DEPOSIT INC
     1REMENTS.)
 15   FORMAT(15X,43HMASS PER UNIT AREA DEPOSITED BETWEEN TIMES F10.1,5H
     1AND F10.1,9H SECONDS.)
 16   FORMAT(/ 3X, 4H*** , 10F12.0, 3H **/)
 17   FORMAT(15X,41HASSUMES ALL PARTICLES ARE GROUNDED BY T1.)
 18   FORMAT(15X, 27HACTIVITY DUE TO MASS CHAIN I4)
 19   FORMAT(15X,26HMULTIPLE BURST BINARY TAPE)
 20   FORMAT(15X,31HGROUND ZERO IS LOCATED AT  X = F10.1,8H   , Y = F10.1
     1)
 23   FORMAT(15X,46HTIME (SECONDS) OF ONSET OF FALLOUT DEPOSITION.)
 24   FORMAT(15X,50HTIME (SECONDS) OF CESSATION OF FALLOUT DEPOSITION.)
```

```
 25   FORMAT(15X,50HDIAMETER (MICRONS) OF SMALLEST DEPOSITED PARTICLE.)
 26   FORMAT(15X,49HDIAMETER (MICRONS) OF LARGEST DEPOSITED PARTICLE.)
 27   FORMAT(15X,58HMASS DEPOSITED (KGM/M**2) BY PARTICLES IN THE SIZE R
     1ANGE  ,E12.5,4H TO ,E12.5, 8H METERS.)
 28   FORMAT(15X,77HH+1 HOUR NORMALIZED EXPOSURE RATE RESULTING FROM PAR
     1TICLES IN THE SIZE RANGE ,E12.5,4H TO ,E12.5,8H METERS.)
 29   FORMAT(15X,28HUNITS ARE ROENTGENS PER HOUR)
 30   FORMAT(15X,19HUNITS ARE ROENTGENS)
 31   FORMAT(15X,18HUNITS ARE KGM/M**2)
 32   FORMAT(15X,21HUNITS ARE CURIES/M**2)
 33   FORMAT(15X,56HTIME OF ARRIVAL ACCOUNTED FOR BY THE APPROXIMATE MET
     1HOD.)
 34   FORMAT(15X,50HTIME OF ARRIVAL ACCOUNTED FOR BY THE EXACT METHOD.)
 35   FORMAT(15X, 34HUNITS ARE EQUIVALENT FISSIONS/M**2)
C
 99   IF(MAPRUN) 101,100,101
  100 DO 1000 I=2,20
      FMTEXP(I)=BLANK
 1000 FMTRUT(I)=BLANK
      TINC=2.0*DGX
      XCOORD=XMIN+DGX
      VINC=INC
      XCINC=VINC*DGX
      KKL=1
      NX=NXMAP
C     LEFT IS USED HERE AS A TEMPORARY STORAGE
      LEFT=(XMAX-X1)/DGX
C     PRINT MAP TITLE
      WRITE (ISOUT,7)
C     SELECT APPROPRIATE DISPLAY OPTION CODE
      IF(JC    )147,147,131
 131  IF(JC    -6)132,132,147
 130  JC    =1
  132 N1=JC
      GO TO (141,142,143,144,145,146),N1
 141  ASSIGN 150 TO N2
      WRITE (ISOUT,3)
      GO TO 102
 142  ASSIGN 151 TO N2
      WRITE (ISOUT,5)
      GO TO 102
 143  WRITE(ISOUT,19)
      ASSIGN 301 TO N2
      IF(LREW.NE.0) GO TO 1431
      LREW=1
      REWIND MBTAPE
 1431 WRITE (MBTAPE)BITLUM
      WRITE(MBTAPE)XMIN,XMAX,YMIN,YMAX,DGX,DGY
      GO TO 102
C
C************************ CODE INSERTION POINTS ************************
 144  CONTINUE
 145  CONTINUE
 146  CONTINUE
C************************ CODE INSERTION POINTS ************************
C
 147  WRITE (ISOUT,6)N1
      GO TO 130
 101  KKL=1
      NX=NXMAP
```

```
C     LEFT IS USED HERE AS A TEMPORARY STORAGE
      LEFT=(XMAX-X1)/DGX
      GO TO 1702
C 102   PRINT ORDINATE DESCRIPTION
C
 102  WRITE (ISOUT,8)
C     NREQ =  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15,
      GO TO(161,162,163,177,164,165,168,169,164,165,166,167,176,171,172,
     1      173,174,175),NREQ
C     NREQ - 16, 17, 18
 161  WRITE (ISOUT,9)
      GO TO 170
 162  WRITE (ISOUT,10)
      WRITE (ISOUT,29)
      GO TO 170
 163  WRITE (ISOUT,11)T1
      WRITE (ISOUT,29)
      GO TO 170
 164  WRITE (ISOUT,12)T1
      WRITE (ISOUT,30)
      IF(NREQ .EQ. 9) GO TO 1264
 1164 WRITE(ISOUT,33)
      GO TO 170
 1264 WRITE(ISOUT,34)
      GO TO 170
 165  WRITE (ISOUT,13)T1,T2
      WRITE (ISOUT,30)
      IF(NREQ-10)1164,1264,1264
 166  WRITE (ISOUT,14)
      WRITE (ISOUT,31)
      GO TO 170
 167  WRITE (ISOUT,15)T1,T2
      WRITE (ISOUT,31)
      GO TO 170
 168  WRITE (ISOUT,13)T1,T2
      WRITE (ISOUT,30)
      WRITE(ISOUT,17)
      GO TO 170
 169  WRITE (ISOUT,12)T1
      WRITE (ISOUT,30)
      WRITE (ISOUT,17)
      GO TO 170
 171  WRITE (ISOUT,18)MASCHN
      IF(T1-TGZ .GT. 0.0) WRITE(ISOUT,32)
      IF(T1-TGZ .EQ. 0.0) WRITE(ISOUT,35)
      GO TO 170
 172  WRITE (ISOUT,23)
      GO TO 170
 173  WRITE (ISOUT,24)
      GO TO 170
 174  WRITE (ISOUT,25)
      GO TO 170
 175  WRITE (ISOUT,26)
      GO TO 170
 176  WRITE (ISOUT,27) T1,T2
      GO TO 170
 177  WRITE (ISOUT,28) T1,T2
      WRITE (ISOUT,29)
      GO TO 170
C
```

```
C************************ CODE INSERTION POINTS ************************
 178  CONTINUE
 179  CONTINUE
C************************ CODE INSERTION POINTS ************************
C
 170  WRITE (ISOUT,20) XGZ,YGZ
 1702 IF(LEFT-NX) 1021,1022,1022
 1021 NX=LEFT
 1022 MM=NX/(INC)
      M=MM+1
C     LEFT IS USED HERE AS THE NUMBER OF PRINT COLUMNS IN THE LAST
C     PRINTER STRIP
      LEFT=NX-MM*(INC)
      IF (LEFT.NE.0) GO TO 2023
      M = MM
      LEFT = INC
C     STRIPS
 2023 DO 110 ISTRIP=1,M
      MAPRUN=MAPRUN+1
      IF (JC    .EQ.3)  GO TO 1023
      ABSSA(1)=XCOORD
      DO 3023 IAB=2,10
 3023 ABSSA(IAB)=ABSSA(IAB-1)+TINC
      WRITE (ISOUT,1)MAPRUN,CPMID,NREQ
      WRITE (ISOUT,16)ABSSA
 1023 KL=KKL+(NYMAP-1)*NXMAP
      IF(ISTRIP-M)103,104,103
 104  KINC=LEFT-1
      VLEFT=LEFT
      XCIN=VLEFT*DGX
      GO TO 1031
 103  KINC=INC-1
      XCIN=XCINC
 1031 CONTINUE
      KLINK = KINC+1
      IF(JC    .EQ.3) WRITE(MBTAPE)NYMAP,KLINK
C
C     ROWS
      YY=YMIN+DGY*FLOAT(NYMAP)
      DO 200 J=1,NYMAP
      KH=KL+KINC
      KDC=0
      DO 201 K=KL,KH
      IF(OMAP(K).LT.CUTMAP)OMAP(K)=0.0
 201  FSUM=FSUM+OMAP(K)
C
C     NUMBERS WITHIN ROWS
      DO 300 K=KL,KH
      KDC=KDC+1
C     TRANSFER TO CODE FOR SELECTED PRESENTATION
      GO TO N2,(150,151,301)
C
C 150 CODE FOR POWER OF TEN DISPLAY
 150  IF(OMAP(K))105,106,107
 105  ASSIGN 121 TO N3
      OMAP(K)=-OMAP(K)
      GO TO 109
 107  ASSIGN 300 TO N3
  109 H = ALOG10(OMAP(K))
      H1=AMOD(H,1.0)
```

```
      JMAP(KDC)=H-H1
      IF(JMAP(KDC).EQ.0) JMAP(KDC)=0
      FMTEXP(KDC+1) = FMTI
      FMTRUT(KDC+1) = FMTF
      IF (JMAP(KDC).NE.0)GO TO 1090
      JMAP(KDC)=0
      FMTEXP(KDC+1) = FMTA
 1090 OMAP(K) = 10.0**H1
      IF(OMAP(K)-9.999)115,115,1091
 1091 OMAP(K)=OMAP(K)/10.0
      JMAP(KDC)=JMAP(KDC)+1
      FMTEXP(KDC+1) = FMTI
      GO TO 115
  106 JMAP(KDC)=0
      OMAP(K)=0.0
      FMTEXP(KDC+1) = FMTA
      FMTRUT(KDC+1) = FMTA
      GO TO 300
  115 GO TO N3,(300,121)
C 121  RESET SIGN OF MAP COORDINATE
  121 OMAP(K)=-OMAP(K)
      GO TO 300
C
C 151 CODE FOR TWO-LINE F11.3 DISPLAY
  151 JMAP(KDC)=OMAP(K)/10.0
      ZMAP=JMAP(KDC)
      OMAP(K)=OMAP(K)-(ZMAP*10.0)
      FMTEXP(KDC+1)= FMTI
      FMTRUT(KDC+1) = FMTF
      FMTEXP(KDC+1)=FMTA
      FMTRUT(KDC+1)=FMTA
  300 CONTINUE
      WRITE(ISOUT,2      ) (JMAP(K),K=1,KDC)
      WRITE(ISOUT,4    )YY,(OMAP(K),K=KL,KH)
      YY=YY-DGY
      GO TO 200
  301 WRITE (MBTAPE) (OMAP(K),K=KL,KH)
  200 KL=KL-NXMAP
      IF (JC    .EQ.3)  GO TO 110
      WRITE (ISOUT,16)ABSSA
      XCOORD=XCOORD+XCIN
  110 KKL=KKL+INC
  111 RETURN
      END
```

```
*DECK,OPMEX
      SUBROUTINE OPMEX(NUMTAP)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C * * * * * * * * * *  OUTPUT PROCESSOR MODULE  * * * * * * * * * * * *
C
C******************************* GLOSSARY *************************
C
C     CAYF                ACTIVITY K FACTOR USED FOR AIRBURSTS AND
C                         ARBITRARY PARTICLE SIZE-ACTIVITY DISTRIBUTIONS.
C                         (R-M**2)/(HR-KT)
C     C                   ACTIVITY DECAY FACTOR (NREQ=5,6)
C     CUTMAP              CUT-OFF THRESHOLD FOR MAP ORDINATE VALUES
C     DELTAX              MAXIMUM WIDTH OF A CORE-LOAD MAP
C     DETID( )            ICRM IDENTIFICATION
C     DGX, DGY            MAP GRID POINT SEPARATION DISTANCES IN THE
C                         X AND Y DIRECTIONS
C     DIAM(I)             PARTICLE SIZE CLASS UPPER BOUNDARY DIAMETERS (M)
C                         (CALLED PACT IN PAM)
C     DTMID( )            DTM IDENTIFICATION
C     FMASS(I)            FALLOUT MASS FRACTION IN EACH PARTICLE SIZE
C                         CLASS FOR A LOGNORMAL SIZE DISTBN.  FOR AN
C                         ARBITRARY SIZE-ACTIVITY DISTBN. IT IS THE
C                         ACTIVITY FRACTION IN EACH PARTICLE SIZE CLASS.
C     FP(I)               TOTAL RADIOACTIVITY IN EACH SIZE CLASS
C     FSUM                SUM OF ALL MAP POINT ORDINATES
C     FW                  FISSION YIELD (KT)
C     GRUFF               A COMBINED GROUND ROUGHNESS AND RADIATION METER
C                         RESPONSE FACTOR (DEFAULT VALUE=0.5)
C     IC(J)               RUN    CONTROL VARIABLES
C       IC(1 ).GT.0       NO MAPS ARE TO BE PRODUCED
C       IC(2 ).GT.0       PRINT CONTENTS OF TAPE IPOUT
C     ICTR                SEE  GOGO GLOSSARY
C     IGO (LOGICAL)       T COMPUTE ACTIVITY, F COMPUTE ATOMIC ABUNDANCES
C     IHOB                .GT. 0 INDICATES AN AIRBURST
C     IH                  PRINTER DESCRIPTION-- NUMBER OF CHARCTERS/INCH
C                         ACROSS A PAGE OF PRINTED OUTPUT (IH=10)
C     IV                  PRINTER DESCRIPTION-- NUMBER OF CHARCTERS/INCH
C                         DOWN   A PAGE OF PRINTED OUTPUT (IV=6)
C     INC                 NUMBER OF MAP ORDINATE COLUMNS THAT CAN BE
C                         ACCOMODATED BY THE PRINTER PAPER
C     INPAM               PAM INPUT DATA TAPE
C     IPNCH               SYSTEM PUNCH TAPE
C     IPOUT               DTM BINARY OUTPUT TAPE.  CONTAINS FALLOUT PARCEL
C                         DATA FOR USE BY THE OPM
C     ISOUT               SYSTEM OUTPUT TAPE NUMBER
C     ISIN                SYSTEM INPUT TAPE NUMBER
C     IRROR               ERROR STOP TRACE WORD
C     JC                  MAP PRINT FORMAT CONTROL
C       JC=1              2 LINE E FORMAT (THIS IS USED ON INPUT DEFAULT)
C       JC=2              2 LINE F11.3 FORMAT
C     JD (LOGICAL)        T COMPUTE EXPOSURE RATE, F COMPUTE DOSE
C     JGO                 PAM CONTROL PARAMETER
C                 1       COMPUTE DISTBN WITH PART.SIZE OF ALL FISS.PRODS.
C                 2       COMPUTE DISTBN WITH PART.SIZE OF ONE MASS CHAIN
C                 3       COMPUTE INDUCED ACTIVITY ONLY
C     KDOS (LOGICAL)      T COMPUTE DOSE FROM TIMES TENTER TO TEXIT
C                         F COMPUTE DOSE FROM TIMES TENTER TO INFINITY
C     KTR(I)              SEE PCHECK GLOSSARY
```

```
C       MARRAY                 FALLOUT PARCEL DATA ARRAYS DIMENSION              OPMEX 61
C       MASCHN                 MASS CHAIN NUMBER FOR A NREQ=14 REQUEST           OPMEX 62
C       MBTAPE                 MULTIBURST OUTPUT TAPE                            OPMEX 63
C       MXREQ                  MAXIMUM NUMBER OF PROCESSING REQUEST TYPES        OPMEX 64
C       NDSTR                  NUMBER OF PARTICLE SIZE CLASSES (CALLED ITAB IN   OPMEX 65
C                              PAM)                                              OPMEX 66
C       NE                     SEE PCHECK GLOSSARY                               OPMEX 67
C       NIJ                    PARCEL BLOCK COUNT                                OPMEX 68
C       NMAP                   MAXIMUM NUMBER OF  MAP POINTS IN A MAP CORE LOADOPMEX 69
C       NOL                    SMALLEST X INDEX OF A MAP POINT TO THE RIGHT OF   OPMEX 70
C                              THE LEFT  BOUNDARY OF THE CONTRIBUTION ELLIPSE    OPMEX 71
C                              OF A PARCEL                                       OPMEX 72
C       NOR                    LARGEST  X INDEX OF A MAP POINT TO THE LEFT  OF   OPMEX 73
C                              THE RIGHT BOUNDARY OF THE CONTRIBUTION ELLIPSE    OPMEX 74
C                              OF A PARCEL                                       OPMEX 75
C       NORD                   ROUTING PARAMETER FOR PARCEL CONTRIBUTIONS        OPMEX 76
C                              AT MAP POINTS - -                                 OPMEX 77
C                                    1 - PARCEL COUNT (NREQ=1)                   OPMEX 78
C                                    2 - STRAIGHTFORWARD ADDITION OF THE         OPMEX 79
C                                        GAUSSIAN DISTRIBUTED QUANTITY TO EACH   OPMEX 80
C                                        MAP POINT (NREQ=2-14)                   OPMEX 81
C                                    3 - TIME OF ONSET (NREQ=15)                 OPMEX 82
C                                    4 - TIME OF CESSATION (NREQ=16)             OPMEX 83
C                                    5 - SMALLEST PARTICLE SIZE (NREQ=17)        OPMEX 84
C                                    6 - LARGEST PARTICLE SIZE (NREQ=18)         OPMEX 85
C       NOX                    TOTAL NUMBER OF MAP POINTS ON THE X AXIS,         OPMEX 86
C                              INCLUDING ALL CORE LOADS                          OPMEX 87
C       NREQ                   COMPUTATION OPTION CODE                           OPMEX 88
C       NRQ                    A COUNTER FOR MAP REQUESTS                        OPMEX 89
C       NST                    TALLY OF PARTICLE DATA BLOCKS                     OPMEX 90
C       NTASK                  A TALLY OF MAP SPECIFICATIONS                     OPMEX 91
C       NUMTAP( )              TAPE NUMBER ARRAY                                 OPMEX 92
C       NXMAP                  NUMBER OF MAP POINTS ON THE X AXIS IN A MAP COREOPMEX 93
C                              LOAD                                              OPMEX 94
C       NYMAP                  NUMBER OF MAP POINTS ON THE Y AXIS IN A MAP COREOPMEX 95
C                              LOAD                                              OPMEX 96
C       NZ                     NUMBER OF MAP CORE LOADS REQUIRED IN ADDITION TOOPMEX 97
C                              THE FIRST                                         OPMEX 98
C       OMAP(J)                THE MAP ORDINATE ARRAY                            OPMEX 99
C       OPMID( )               OUTPUT PROCESSOR IDENTIFICATION                   OPMEX100
C       PS(I)                  PARTICLE SIZE CLASS CENTRAL DIAMETERS(M)          OPMEX101
C       QCUT                   CUT-OFF THRESHOLD FOR AN INDIVIDUAL DEPOSIT       OPMEX102
C                              INCREMENT CONTRIBUTION                            OPMEX103
C       SLDTMP                 SOIL SOLIDIFICATION TEMPERATURE(DEG. K)(FROM CRMOPMEX104
C       TEXIT                  TIME RELATIVE TO SHOT TIME CORRESPONDING TO T2    OPMEX105
C       TIME,TENTER            TIME RELATIVE TO SHOT TIME CORRESPONDING TO T1    OPMEX106
C       TMSO                   TIME OF SOIL SOLIDIFICATION( FROM CRM )(SEC)      OPMEX107
C       T1,T2                  REQUEST TIME ARGUMENTS OR PARTICLE SIZES          OPMEX108
C       W                      TOTAL EXPLOSION ENERGY YIELD (KT)                 OPMEX109
C       WFMAS(I)               TOTAL MASS OF FALLOUT IN EACH PARTICLE SIZE       OPMEX110
C                              CLASS/ GRUFF FOR A LOGNORMAL PARTICLE DISTBN.     OPMEX111
C                              ACTIVITY FRACTION IN EACH SIZE CLASS/GRUFF FOR    OPMEX112
C                              AN ARBITRARY PARTICLE SIZE-ACTIVITY DISTRIBUTIONOPMEX113
C       XPAR,YPAR,ZPAR,        FALLOUT PARCEL DESCRIPTION DATA (ALL INDEXED)     OPMEX114
C         TPAR,SIGXO,SIGYO,                                                      OPMEX115
C         RO,PSIZ,PMAS                                                           OPMEX116
C       XMAX,XMIN              MAXIMUM AND MINIMUM X COORDINATES OF THE MAP      OPMEX117
C       YMAX,YMIN              MAXIMUM AND MINIMUM Y COORDINATES OF THE MAP      OPMEX118
C       X1,X2                  X AXIS BOUNDRY COORDINATES OF THE CURRENT MAP     OPMEX119
C                              CORE LOAD                                         OPMEX120
```

```
C     ZMIN                 DEPOSITION PLANE ALTITUDE (M RELATIVE TO MSL)
C     ZSCL                 SCALED HEIGHT OF BURST (FT/W**(1.0/3.4))
C
C ***********************************************************************
C
      COMMON /CONDAT/       IC(20)     ,IHOB       ,IPNCH      ,IPOUT     ,
     1ISIN       ,ISOUT      ,JPOUT      ,KPOUT      ,KTAPE      ,LTAPE     ,
     2MARRAY     ,MBTAPE     ,MXREQ      ,SD         ,INPAM
      COMMON /MAPDAT/ CAYF ,CUTMAP      ,DGX        ,DGY        ,IH   ,IV  ,
     1JC         ,NXMAP      ,NYMAP      ,NZ         ,QCUT       ,SSAM      ,
     2TGZ        ,XGZ        ,X1         ,X2         ,YGZ        ,XMAX      ,
     3XMIN       ,YMAX       ,YMIN       ,ZMIN
      DIMENSION NUMTAP(15),OMAP(  5000)
      DATA    NMAP        ,   MARRAY    ,    MXREG    ,   IH   ,   IV
     1   /    5000        ,    100      ,     18      ,   10   ,    6   /
C
      ISIN =NUMTAP( 1)
      ISOUT=NUMTAP( 2)
      IPOUT=NUMTAP( 3)
      JPOUT=NUMTAP( 5)
      KPOUT=NUMTAP( 6)
      IPNCH=NUMTAP( 7)
      MBTAPE=NUMTAP(8)
      INPAM=NUMTAP( 9)
      CALL        OPM1
      CALL        OPM2(OMAP,NMAP)
      RETURN
      END
```

```
*DECK,OPM1
      SUBROUTINE OPM1(NUMTAP)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C************************************************************************
C
C     THIS PROGRAM INITIALIZES AND WRITES HEADINGS FOR THE OUTPUT
C     PROCESSOR.  THEN IT CALLS THE FIRST PART OF THE PARTICLE ACTIVITY
C     MODULE (PAM1 OR PAM1A) TO PRECOMPUTE DATA USED BY THE SECOND PART
C     OF THE PARTICLE ACTIVITY MODULE WHICH IS CALLED BY OPM2.
C
C     PAM1 IS USED FOR CASES WHERE THE FIREBALL INTERSECTS THE GROUND
C     AND PARTICLE SIZE DISTRIBUTION IS LOGNORMAL.   PAM1A IS USED FOR
C     AIRBURSTS AND FOR ARBITRARY PARTICLE SIZE-ACTIVITY DISTRIBUTIONS.
C
C ***********************************************************************
C
      COMMON /CONDAT/       IC(20)     ,IHOB       ,IPNCH      ,IPOUT     ,
     1ISIN       ,ISOUT      ,JPOUT      ,KPOUT      ,KTAPE      ,LTAPE     ,
     2MARRAY     ,MBTAPE     ,MXREQ      ,SD         ,INPAM
      COMMON /MAPDAT/ CAYF ,CUTMAP      ,DGX        ,DGY        ,IH   ,IV  ,
     1JC         ,NXMAP      ,NYMAP      ,NZ         ,QCUT       ,SSAM      ,
     2TGZ        ,XGZ        ,X1         ,X2         ,YGZ        ,XMAX      ,
     3XMIN       ,YMAX       ,YMIN       ,ZMIN
      COMMON /PARDAT/       ASQ        ,BSQ        ,COSA       ,F         ,
     1GAMA       ,IP         ,PMAS(100)  ,PSIZ(100)  ,RO(100)    ,SIGXO(100),
```

```
     2SIGYO(100),SINA      ,TPAR(100) ,XPAR(100) ,YPAR(100) ,YPRML     ,
     3YPRMU      ,ZPAR(100)
      COMMON /RUNDAT/       C              ,CF6        ,FSUM       ,ICTR      ,
     1MAPRUN     ,NE        ,NIJ           ,NORD       ,NREQ       ,NTASK     ,
     2OPMID(12) ,T1         ,T2            ,WFMAS(200)
      COMMON /FISHIN/ ABEGN(700),ABUNDO(700),BRANCH(130),CAPFIS,
     1  DCON(700),IBRA,INUC,MAXNUC,MULT(11),NUCLID(700)
      COMMON /OUTPUT/ FISNUM,FF(200),FW,NDSTR,JGC,MASCHN,PS(200),
     1 FMASS(200),DIAM(200)
      COMMON /UTILTY/  KCUT,NPRNT(15)
      INTEGER FISSID
      LOGICAL NPRNT
      DIMENSION DETID(12),DTMID(12),NUMTAP(15)
      DATA PROGRM /6H OPM1 /
C
 1    FORMAT(12A6)
 3    FORMAT(8L1)
 4    FORMAT (A6,4X,2F10.3)
    5 FORMAT(/ 30X, 51HU238 INDUCED ACTIVITY - CAPTURE-TO-FISSION RATIC
     1ISF7.3)
    6 FORMAT(/ 30X, 56HSOIL INDUCED ACTIVITY - NEUTRONS EMITTED PER FISS
     1ION AREF7.3)
    7 FORMAT ( /47X19HTYPE OF FISSION IS A6)
    8 FORMAT ( /21X55HTHE CLOUD REACHED THE SOIL CONDENSATION TEMPERATUR
     1E OF F7.1,4H AT F8.4,5H SEC.)
    9 FORMAT (/ 43X14HTOTAL YIELD IS,1PE12.4,10H KILOTONS.,
     1           /41X16HFISSION YIELD IS,1PE12.4,10H KILOTONS.)
 10   FORMAT(// 41X, 38H****  SUMMARY OF RUN IDENTIFIERS  ****/ 41X,
     1 19HOUTPUT PROCESSOR - 12A6,/ 28X, 32HINITIALIZATION AND CLOUD RIS
     2E - 12A6/ 38X, 22HDIFFUSIVE TRANSPORT - 12A6)
 15   FORMAT(20I4)
 16   FORMAT(/22X77H****  THE CONTROL VARIABLE ARRAY, IC(J), WAS GIVEN T
     1HE FOLLOWING VALUES  ****/ 19X, 20I4)
 17   FORMAT ( /45X9HTHERE ARE,I4,17H PARTICLE CLASSES)
 18   FORMAT ( /41X, 22HTHE HEIGHT OF BURST IS , F9.3, 8H METERS. )
 21   FORMAT( /39X43HPRINTER DESCRIPTION  -  CHARACTERS PER INCH/
     1        42X,10HHORIZONTALI5,10X,10HVERTICAL  I3)
 26   FORMAT( 15X, 4HXPAR, 8X,4HYPAR, 8X, 4HZPAR, 8X, 4HTPAR,  7X,
     1 5HSIGXO, 7X, 5HSIGYO, 8X, 2HRO, 9X, 4HPSIZ, 8X, 4HPMAS//)
 28   FORMAT( 1H1,   50X, 19H* * * * * * * * * *//55X,11HD E L F I C//
     1                                          12X101HT H E   D E P A R T
     2 M E N T   O F   D E F E N S E   F A L L O U T   P R E D I C T I O
     3 N   S Y S T E M,//51X,19H* * * * * * * * * *////48X,23HOUTPUT PRO
     4CESSOR MODULE///55X,11HPREPARED BY/45X,30HATMOSPHERIC SCIENCE ASSO
     5CIATES/ 53X, 14HBEDFORD, MASS.)
 29   FORMAT(////45X38HLISTING OF FALLOUT PARCEL DESCRIPTIONS)
 30   FORMAT(//10X6HBLOCK I4)
 36   FORMAT(10X,9E12.4)
 37   FORMAT(10X, 43HNUMBER OF FALLOUT PARCELS IN THIS BLOCK IS I4)
 39   FORMAT(46H NO MAPS.  THIS RUN FOR TAPE IFOUT PRINT ONLY.)
   40 FORMAT( //25X,   63HTHIS IS AN AIRBURST.  PARTICLE ACTIVITIES ARE C
     1OMPUTED BY PAMA / 30X, 11HSCALED HOB=E12.5, 7H (FEET))
 41   FORMAT( /40X, 42HSOIL INDUCED ACTIVITY IS NOT ACCOUNTED FOR)
 42   FORMAT(1H0, 11X,  53HFISSION YIELD IS ADJUSTED BY THE FRACTION-DOW
     1N FACTORF8.5, 16H FOR SCALED HOB=1PE11.4, 13H FT W**(-1/3))
C
      NTASK=0
      KOUT=ISOUT
      DO 50 I=1,200
   50 PS(I)=0.0
```

```
COMMENCE READING IPOUT HEADER DATA
      READ (IPOUT)FW,SSAM,SLDTMP,TMSD,SD,W,HEIGHT,RHCF,RADMAX,ZMIN
      READ (IPOUT)XGZ,YGZ,TGZ
      READ  (IPOUT)  (DETID(J),J=1,12)
      READ  (IPOUT)  (DTMID(J),J=1,12)
      READ  (IPOUT)NDSTR
      READ  (IPOUT)(PS(J),DIAM(J),FMASS(J),J=1,NDSTR)
CONVERT HEIGHT IN METERS TO HOB IN FEET
      HOB=HEIGHT/.3048
COMMENCE READING CARD INPUT
      READ (ISIN,1)OPMID
      READ (ISIN,15)IC
      READ(ISIN,3)NPRNT(6),NPRNT(7),(NPRNT(I),I=9,13),NPRNT(15)
      READ(ISIN,4)FISSID,EMITN,CAPFIS
COPY OUT HEADER AND CRITICAL DATA
      WRITE (ISOUT,28)
      WRITE (ISOUT,10) OPMID,DETID,DTMID
      WRITE (ISOUT,16) IC
      WRITE (ISOUT,9)W,FW
      WRITE (ISOUT,7)FISSID
      WRITE (ISOUT,18)HEIGHT
CHECK SCALED HOB TO SEE IF THIS IS AN AIRBURST
      IHOB=0
      ZSCL=HOB/W**(1.0/3.4)
      IF(ZSCL .GE. 180.) IHOB=1
      IF(IHOB .GT. 0) GO TO 75
COMPUTE FRACTION-DOWN  ADJUSTMENT FACTOR FOR FISSION YIELD
      IF(ZSCL .LE. 0.0) GO TO 60
      ZSCM = HOB/W**(0.3333333333)
      FD = (0.45345)**(ZSCM/65.0)
      WRITE(ISOUT,42) FD, ZSCM
      FW=FW*FD
   60 IF(SD .LE. 0.0) GO TO 75
      IF(CAPFIS .GT. 0.0) WRITE(ISOUT,5)CAPFIS
      IF( EMITN .GT. 0.0) WRITE(ISOUT,6) EMITN
      IF(EMITN .EQ. 0.0) WRITE(ISOUT,41)
      WRITE (ISOUT,8)SLDTMP,TMSD
   75 WRITE(ISOUT,17) NDSTR
  100 WRITE (ISOUT,21)IH,IV
      IF(IC(2))501,501,500
COPY OUT CONTENTS OF TAPE IPOUT
  500 NST = 0
      WRITE (ISOUT,29)
  600 READ (IPOUT)NIJ
      NST=NST+1
      IF(NIJ) 503,501,504
  503 CALL ERROR(PROGRM,-503,ISOUT)
  504 READ(IPOUT)(XPAR(I),YPAR(I),ZPAR(I),TPAR(I),SIGXO(I),SIGYO(I),
     1 RO(I),PSIZ(I),PMAS(I),I=1,NIJ)
      WRITE (ISOUT,30)NST
      WRITE (ISOUT,37)NIJ
      WRITE (ISOUT,26)
      WRITE(ISOUT,36)(XPAR(I),YPAR(I),ZPAR(I),TPAR(I),SIGXO(I),SIGYO(I),
     1 RO(I),PSIZ(I),PMAS(I),I=1,NIJ)
      GO TO 600
  501 REWIND IPOUT
CHECK IC(1).  A POSITIVE VALUE TERMINATES RUN WITHOUT PAM OR MAP CALCS.
      IF(IC(1) .LE. 0) GO TO 511
  510 WRITE (ISOUT,39)
      CALL EXIT
```

```
C
  511 IF(IHOB .EQ. 0) IF(SD)515,515,520
      WRITE( ISOUT,40 ) ZSCL
  515 CALL PAM1A(FISSID)
      RETURN
  520 CALL PAM1
     1     (HOB    ,SLOTMP ,TNSC    , W ,EMITN, FISSID )
      RETURN
      END
```

```
*DECK,OPM2
      SUBROUTINE OPM2(OMAP,NMAP)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     SECOND HALF OF THE OUTPUT PROCESSOR
C     THIS SUBROUTINE INITIALIZES AND CONTROLS FOR MAF CALCULATIONS
C
C ***********************************************************************
C
      COMMON /CONDAT/        IC(20)     ,IHOB       ,IPNCH      ,IPOUT      ,
     1ISIN       ,ISOUT      ,JPOUT      ,KPOUT      ,KTAPE      ,LTAPE      ,
     2MARRAY     ,MRTAPE     ,MXREQ      ,SD         ,INFAM
      COMMON /MAPDAT/ CAYF ,CUTMAP     ,DGX        ,DGY        ,IH   ,IV    ,
     1JC         ,NXMAP      ,NYMAP      ,NZ         ,QCUT       ,SSAM       ,
     2TGZ        ,XGZ        ,X1         ,X2         ,YGZ        ,XMAX       ,
     3XMIN       ,YMAX       ,YMIN       ,ZMIN
      COMMON /RUNDAT/        C           ,CF6        ,FSUM       ,ICTR       ,
     1MAPRUN     ,NE         ,NIJ        ,NORD       ,NREC       ,NTASK      ,
     2OPMID(12)  ,T1         ,T2         ,WFMAS(200)
      COMMON /DECAY/ IGC,JC,KDCS,TENTER,TEXIT,TIME
      COMMON /OUTPUT/ FISNUM,FP(200),FW,NDSTR,JGC,MASCHN,PS(200),
     1 FMASS(200),DIAM(200)
      COMMON /UTILTY/  KCUT,NPRNT(15)
      LOGICAL IGO,JD,KDCS,NPRNT
      DIMENSION CONTUR(8), OMAP(NMAP)
      DATA BLANK/1CH          / ,PROGRM/ 6H OPM2 /, NUL/C/
      DATA QCUTA,CUTMPA/0.C001, 0.01 /
C
    2 FORMAT (//15X,23HSUM OF MAP ORDINATES = E13.6 )
    3 FORMAT(1H1////54X,11H* * * * * *)
    4 FORMAT(// 15X, 52HCOMBINED GROUND ROUGHNESS-INSTRUMENT RESPONSE FA
     1CTORF10.3,  5X, 14HALTITUDE OF GZF10.3,17H METERS ABOVE MSL)
    9 FORMAT(7F10.3)
   17 FORMAT(32H OUTPUT PROCESSING IS COMPLETED.)
   23 FORMAT(1H1///39X27H****  OUTPUT PROCESSOR TASKI5,6H  ****)
   24 FORMAT(///15X25HGRID LIMITS AND INTERVALS/20X4HXMIN10X4HXMAX10X4HY
     1MIN10X4HYMAX10X7HDELTA X,8X7HDELTA Y/15XF10.0, 4XF10.0,4XF10.0,4XF1
     20.0,5XF10.2,5XF10.2)
   32 FORMAT(4I5, 4F10.0)
   33 FORMAT(25H0UNACCEPTABLE REQUEST ...I4)
   34 FORMAT(////15X,15HREQUEST NUMBER I4///15X8HMAP TYPEI3,10X5HT1 = F1
     10.2,10X,5HT2 = F10.2,15X,9HMASCHN = I4// 15X,6HQCUT= ,E12.5,10X,8H
     2CUTMAP= ,E12.5)
```

```
 41   FORMAT (//25X, 19HMASCHN SET EQUAL TOI5)
 44   FORMAT( 8F10.3/A10)
 45   FORMAT(/ 15X, 93HCONTOURS ARE NOT DETERMINED BECAUSE THE REQUESTED
     1 MAP EXCEEDS ALLOCATED CORE STORAGE CAPACITY)
 46   FORMAT(/15X, 56HTHE SPECIFIED MAP GRID INCREMENTS PRODUCE DISTORTE
     1D MAPS)
 47   FORMAT(/15X, 66HUNDISTORTED MAPS ARE PRODUCED BY THE GRID INCREMEN
     1TS PRINTED ABOVE)
C
      IGO=.TRUE.
C
COPY IN MAP LIMITING COORDINATES, GRID INTERVALS, AND COMBINED GROUND
C     ROUGHNESS-SURVEY INSTRUMENT RESPONSE FACTOR.
 1191 READ(ISIN,9)XMIN,XMAX,YMIN,YMAX,DGX,DGY,GRUFF
      IF(GRUFF .EQ. 0.0) GRUFF=1.0
 1603 IF(ABS(DGX) + ABS(DGY))120,120,121
 120  WRITE (ISOUT,17)
      REWIND IPOUT
      RETURN
C
COMMENCE PROCESSING FOR MAPS OF THIS DESCRIPTION
  121 NTASK=NTASK+1
      FSUM=0.0
C
      NRQ=0
CALCULATE ADJUSTED MAP GRID INCREMENTS TO ASSURE AN UNDISTORTED MAP
      NSP=1
      IF(DGY .GT. 0.0) GO TO 1300
      DGY=DGX*IH/IV/2.0
 1300 IF(DGX .EQ. 2.0*IV*DGY/IH) NSP=0
CALCULATE NUMBER OF MAP CORE LOADS BEYOND THE FIRST, NZ.
      NZ=0
      NYMAP = (YMAX - YMIN)/DGY
      NOX=(XMAX-XMIN)/DGX
      NXMAP=NOX
      NST = NMAP/NYMAP
      IF(NXMAP .LE. NST) GO TO 1401
      NXMAP=NST
 1400 IF(NXMAP .LE. 0) CALL ERROR(PROGRM,-1400,ISOUT)
      NZ=NOX/NXMAP
 1401 DO 1121 J=1,NDSTR
      WFMAS(J)=FMASS(J)/GRUFF
      IF(SD .GT. 0.0) WFMAS(J)=WFMAS(J)*SSAM
 1121 CONTINUE
COPY OUT A LOCAL HEADING
      WRITE (ISOUT,23)NTASK
      WRITE(ISOUT,24) XMIN,XMAX,YMIN,YMAX,DGX,DGY
      WRITE (ISOUT,4)  GRUFF ,ZMIN
      IF(NSP)1123,1123,1122
 1122 WRITE(ISOUT,46)
      GO TO 1211
 1123 WRITE(ISOUT,47)
C
 1211 CONTINUE
C
 1209 IF(FSUM .NE. 0.0) WRITE(ISOUT,2)FSUM
      IF(NZ .GT. 0) NXMAP=NST
COPY IN A MAP REQUEST
      READ(ISIN,32)NREQ,JC,ICONT,MASCHN,T1,T2,CCUT,CUTMAP
      IF(ICONT .NE. 0) READ(ISIN,44 ) CONTUR,CRDLBL
```

```
      IF(ICONT .GT. 1) IFNCH=-1
      IF(JC .EQ. 0)JC=1
CHECK REQUEST SPECIFICATIONS AND SET DEFAULT VALUES FOR QCUT AND CUTMAP
      IF(NREQ .EQ. 0) GO TO 1191
 1213 IF(NREQ .LE. MXREQ)GO TO 400
      IRROR=1213
  403 WRITE(ISOUT,33)NREQ
      CALL ERROR(PROGRM,IRROR,ISOUT)
      GO TO 1211
  400 IF(QCUT .GT. 0.0) GO TO 500
      IF(NREQ .NE. 14) GO TO 402
      IF(T1 .GT. 0.0) GO TO 404
      QCUT  = QCUTA*2.08E13
      GO TO 500
  404 QCUT  = QCUTA*1.0E-4
      GO TO 500
  402 IF(NREQ .LT. 2  .OR.  NREQ .GT. 10 ) GO TO 401
      QCUT=QCUTA
      IF(NREQ .EQ. 3 .AND. T1 .GT. 1.0) QCUT=QCUT*T1**(-1.26)
      IF(NREQ .GE. 5 .AND. NREQ .LE. 10 .AND. T1 .GT. 1.0)QCUT=QCUT*
     1 3.846*T1**(-0.26)
      IF((NREQ.EQ. 6 .OR. NREQ .EQ. 7 .OR. NREQ .EQ. 10) .AND.(T1.GT. 1.0
     1    .AND. T2 .NE. 0.0)) QCUT = QCUT *(1.0-(T1/T2)**(0.26))
      GO TO 500
  401 QCUT=QCUTA*SSAM/(7.0E9*GRUFF*FW)
  500 IF(CUTMAP .GT. 0.0) GO TO 600
      IF(NREQ .NE. 14) GO TO 502
      IF(T1 .GT. 0.0) GO TO 503
      CUTMAP=CUTMPA*2.08E13
      GO TO 600
  503 CUTMAP=CUTMPA*1.0E-4
      GO TO 600
  502 IF(NREQ .LT. 2  .OR.  NREQ .GT. 10 ) GO TO 501
      CUTMAP=CUTMPA
      IF(NREQ .EQ. 3 .AND. T1 .GT. 1.0) CUTMAP=CUTMAP*T1**(-1.26)
      IF(NREQ .GE. 5 .AND. NREQ .LE. 10 .AND. T1 .GT. 1.0)CUTMAP=CUTMAP*
     1 3.846*T1**(-0.26)
      IF((NREQ.EQ. 6 .OR. NREQ .EQ. 7 .OR. NREQ .EQ. 10) .AND.(T1.GT. 1.0
     1    .AND. T2 .NE. 0.0))CUTMAP=CUTMAP*(1.0-(T1/T2)**(0.26))
      GO TO 600
  501 CUTMAP=CUTMPA*SSAM/(7.0E9*GRUFF*FW)
  600 IF(IHOB .EQ. 0  .AND.  SD .GT. 0.0) IF(NREQ-14)1210,690,1210
  601 IF(NREQ .NE. 9  .AND.  NREQ .NE. 10 .AND. NREQ. NE. 14)GO TO 1210
      IRROR= 601
      GO TO 403
  690 IF(MASCHN.GT.71.AND.MASCHN.LT.162)GO TO 1210
      WRITE(ISOUT,33)NREQ
      CALL ERROR(PROGRM, 690,ISOUT)
      MASCHN=95
      WRITE(ISOUT,41)MASCHN
COMMENCE PROCESSING FOR THIS MAP REQUEST
CLEAR OUT THE OMAP ARRAY
 1210 CLROT=0.0
      IF((NREQ.EQ.15).OR.(NREQ.EQ.17)) CLROT=1.E30
      DO 935 I=1,NMAP
  935 OMAP(I)=CLROT
COPY PAST IPOUT HEADER DATA TO POSITION TAPE AT START OF PARCEL DATA
      REWIND IPOUT
      DO 1214 I=1,6
 1214 READ(IPOUT)
```

```
      NRQ=NRQ+1
      IF(NRQ .NE. 1) WRITE(ISOUT,3)
      WRITE (ISOUT,34) NRQ,NREQ,T1,T2,MASCHN ,QCUT,CUTMAP
      IF(ICONT .NE. 0  .AND.  NZ .GT. 0) WRITE(ISOUT,45)
      MAPRUN=0
      FSUM = 0.0
      JGO=1
      JD=.TRUE.
      KDOS=.FALSE.
      FISNUM=FW*1.45E15
      NORD=1
      C=1.0
      CF6=1.0
      IF(NREQ .EQ. 9  .OR.  NREQ .EQ. 10) NPRNT(15)=.TRUE.
      IF(NREQ .NE. 13  .AND.  NREQ .NE. 4) GO TO 980
      T1=T1*1.0E-6
      T2=T2*1.0E-6
      GO TO 985
  980 T1=T1*3600. + TGZ
      T2=T2*3600. + TGZ
      TIME=T1-TGZ
      TENTER=TIME
      TEXIT=T2-TGZ
C     NREQ -  1, 2, 3, 4, 5, 6, 7, 8, 9,10,11,12,13,14,15,16,17,18
  985 GO TO (90,70,79,70,69,68,73,78,78,73,80,80,80,71,80,80,80,80),NREQ
   68 CF6=CF6*(1.0 - (TIME/TEXIT)**(0.26))
   69 CF6=32.3344*CF6*(TIME)**(-0.26)
   70 TIME=3600.0
      GO TO 79
   71 JGO=2
      FISNUM=FISNUM*1.E+4
      IF(  IHOB .GT. 0 ) CALL ERROR( PROGRM, -71, ISCUT )
      GO TO 790
   73 KDOS=.TRUE.
   78 JD=.FALSE.
      FISNUM=FISNUM/3600.
   79 CONTINUE
      IF(  IHOB .EQ. 0 .AND.  SD .GT. 0.0 ) GO TO 790
      CALL  AM2A
      GO TO 80
  790 CALL PAM2
   80 NORD=NORD+1
   90 NORD=MAX0(NORD,NORD+NREQ-14)
C
C *********************************************************************
C
      X1=XMIN
      X2=X1+NXMAP*DGY
      ICTR=0
      IF(NZ)203,204,207
  203 CALL ERROR(PROGRM,-203,ISOUT)
COMPUTE A SINGLE CORE-LOAD MAP
  204 KTAPE=IPOUT
      CALL GOGO(OMAP,NMAP)
      REWIND KTAPE
      IF((NREQ.NE.15).AND.(NREQ.NE.17)) GO TO 305
      DO 302 IMAP=1,NMAP
      IF(OMAP(IMAP).GE.1.E30) OMAP(IMAP)=0.0
  302 CONTINUE
  305 IF(ICONT .NE. 0 .AND. CROLBL .NE. BLANK)CALL CONTOR(CONTUR,CROLBL,
```

```
      1 OMAP,NMAP)
        CALL MAP(OMAP,NMAP)
        GO TO 1211
C OMPUTE A MULTIPLE CORE-LOAD MAP
    207 REWIND JPOUT
        REWIND KPOUT
        KTAPE=IPOUT
        LTAPE=JPOUT
        CALL GOGO(OMAP,NMAP)
        REWIND KTAPE
        WRITE(LTAPE)NUL
        REWIND LTAPE
        IF((NREQ.NE.15).AND.(NREQ.NE.17)) GO TO 308
        DO 306 IMAP=1,NMAP
        IF(OMAP(IMAP).GE.1.E30) OMAP(IMAP)=0.0
    306 CONTINUE
    308 CALL MAP(OMAP,NMAP)
        DO 220 INDEX=1,NZ
C LEAR OUT THE OMAP ARRAY
        CLROT=0.0
        IF((NREQ.EQ.15).OR.(NREQ.EQ.17)) CLROT=1.E30
        DO 702 IMAP=1,NMAP
    702 OMAP(IMAP)=CLROT
        IF(MOD(INDEX,2).EQ.1) GO TO 208
        KTAPE=KPOUT
        LTAPE=JPOUT
        GO TO 209
    208 KTAPE=JPOUT
        LTAPE=KPOUT
    209 ICTR=INDEX
        IF(INDEX .EQ. NZ) NXMAP=NOX - NZ*NXMAP
        X1=X2
        X2=X1+NXMAP*DGX
    210 CALL GOGO(OMAP,NMAP)
        REWIND KTAPE
        WRITE(LTAPE)NUL
        REWIND LTAPE
        IF((NREQ.NE.15).AND.(NREQ.NE.17)) GO TO 220
        DO 215 IMAP=1,NMAP
        IF(OMAP(IMAP).GE.1.E30) OMAP(IMAP)=0.0
    215 CONTINUE
    220 CALL MAP(OMAP,NMAP)
        GO TO 1211
        END
```

```
*DECK,PAM1A
      SUBROUTINE PAM1A(FISSID)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - JANUARY 1979
C
C ***********************************************************************
C
C     PART 1 OF THE AIRBURST AND USER SPECIFIED SIZE-ACTIVITY PARTICLE
C     ACTIVITY MODULE
C
C     MATCHES THE FISSION TYPE INDICATOR, FISSID,  WITH THE STORED TABLE
C     OF TYPES AND  STORES  THE ACTIVITY K FACTOR (R-M**2)/(HR-KT)
C     IN CAYF.
C
C ***********************************************************************
C
      COMMON /MAPDAT/ CAYF ,CUTMAP     ,DGX        ,DGY        ,IH   ,IV   ,
     1JC          ,NXMAP      ,NYMAP      ,NZ         ,GOUT       ,SSAM       ,
     2TGZ         ,XGZ        ,X1         ,X2         ,YGZ        ,XMAX       ,
     3XMIN        ,YMAX       ,YMIN       ,ZMIN
      COMMON /UTILTY/  KOUT,NPRNT(15)
      INTEGER FISSID,FISTP
      LOGICAL NPRNT
      DIMENSION FISTP( 7), FK( 7)
      DATA PROGRM / 6HPAMAB1 /
      DATA  FISTP
     1/ 6HU233HE,6HP239HE,6HP239FI,6HU235HE,6HU235FI,6HU238TN,6HU238HE /
      DATA     FK
     1/ 5.3010E9,6.0830E9,6.9733E9,7.2911E9,7.8643E9,7.9407E9,8.2111E9 /
C
 1100 FORMAT(///10X, 45HFISSID DOES NOT MATCH WITH ANY AVAILABLE TYPE)
C
      DO 100 I=1,7
      IF(FISSID .EQ. FISTP(I)) GO TO 200
  100 CONTINUE
      WRITE( KOUT ,1100 )
      CALL ERROR( PROGRM, -100, KOUT)
  200 CAYF = FK(I)
      RETURN
      END
```

```
*DECK,PAM2A
      SUBROUTINE PAM2A
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ***********************************************************************
C
C     PART 2 OF THE AIRBURST AND USER SPECIFIED SIZE-ACTIVITY PARTICLE
C     ACTIVITY MODULE
C
C     COMPUTES THE PARTICLE ACTIVITY-SIZE ARRAY FP( ).   FP(I) CONSISTS
C     OF THE EXPOSURE RATE, FOR ACTIVITY CONCENTRATED IN ONE SQUARE
C     METER OF GROUND SURFACE, ASSOCIATED WITH PARTICLES OF THE ITH
C     SIZE CLASS.
C
C     JD            (LOGICAL) TRUE-COMPUTE EXPOSURE RATE AT TIME TIME
C                             FALSE-COMPUTE DOSE
C     KDOS          (LOGICAL) TRUE-COMPUTE DOSE FROM TIME TENTER TO TEXIT
C                             FALSE-COMPUTE DOSE FROM TIME TENTER TO INF.
C     CAYF          ACTIVITY K FACTOR (R-M**2/HR-KT)
C
C ***********************************************************************
C
      COMMON /DECAY/ IGO,JD,KDOS,TENTER,TEXIT,TIME
      COMMON /MAPDAT/ CAYF ,CUTMAP    ,DGX       ,DGY       ,IH  ,IV   ,
     1 JD         ,NXMAP     ,NYMAP     ,NZ        ,QCUT      ,SSAM      ,
     2 YGZ        ,XGZ       ,X1        ,X2        ,YGZ       ,XMAX      ,
     3 XMIN       ,YMAX      ,YMIN      ,ZMIN
      COMMON /OUTPUT/ FISNUM,FF(200),FW,ITAB,JGO,MASCHN,PSIZE(200),
     1 FMASS(200),PACT(200)
      COMMON /UTILTY/  KOUT,NPRNT(15)
      LOGICAL IGO,JD,KDOS,NPRNT
 1000 FORMAT( 1H1, 5X, 53HTABLE OF TOTAL ACTIVITY IN EACH PARTICLE SIZE
     1CLASS -// 4(6X, 5HPSIZE, 10X, 2HFP, 5X))
 2000 FORMAT( 8(1PE14.4))
 3000 FORMAT( 1H0,13X, 11HK FACTORS -, 10X, 1PE11.4,
     1  17H (R-M**2)/(HR-KT), 10X, 1PE11.4, 18H (R-MI**2)/(HR-KT))
C
      A = CAYF * FW
      IF( JD ) GO TO 100
      A = 32.3344 * A / TENTER**(0.26)
      IF( KDOS ) A = A*(1.0 - (TENTER/TEXIT)**(0.26))
      GO TO 200
  100 IF( TIME .EQ. 3600. ) GO TO 200
      A = A * (3600./TIME)**(1.26)
  200 CONTINUE
      DO 300 I=1,ITAB
  300 FP(I) = A* FMASS(I)
      IF(      NPRNT(15)) RETURN
      NTAB=ITAB/4
      IF(NTAB*4 .LT. ITAB)NTAB=NTAB+1
      WRITE( KOUT ,1000 )
      WRITE (KOUT,2000)(PSIZE(I),FP(I),PSIZE(I+NTAB),FP(I+NTAB),
     1 PSIZE(I+2*NTAB),FP(I+2*NTAB),PSIZE(I+3*NTAB),FP(I+3*NTAB),I=1,
     2 NTAB)
      CAYFA =CAYF  *3.861E-7
      WRITE(KOUT,3000)CAYF  ,CAYFA
      RETURN
      END
```

```
*DECK,PCHECK
      SUBROUTINE PCHECK(IJIN,OMAP,NMAP)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1978
C
C ************************************************Q*****************
C
C     THIS SUBROUTINE  DETERMINES THE TYPE OF MAP REQUESTED AND
C     IT INITIALIZES FOR THIS MAP.  FOR EACH PARCEL IN THE DATA BLOCK
C     IT COMPUTES THE BOUNDRIES  OF ITS CONTRIBUTION ELLIPSE AND
C     IT LABELS IT ACCORDING TO WHETHER IT WILL CONTRIBUTE TO
C     SUBSEQUENT MAP CORE LOADS OR NOT.  IF A PARCEL CONTRIBUTES TO
C     THE CURRENT MAP CORE LOAD , SUBROUTINE CALC IS CALLED.
C
C ******************************************************************
C
C********************************* GLOSSARY ************************
C
C     J            PARTICLE SIZE CLASS INDEX
C     KTR(IP)      INDICATES WHETHER OR NOT THE PARCEL IS TO BE
C                  CONSIDERED  IN SUBSEQUENT MAP CORE LOADS - -
C                            0 - CONSIDER  PARCEL  SUBSEQUENTLY
C                            1 - REJECT  PARCEL  FOR FURTHER USE
C     YPRMU        UPPER Y COORDINATE LIMIT FOR  PARCEL  CONTRIBUTION
C     XPRMU        UPPER X COORDINATE LIMIT FOR  PARCEL  CONTRIBUTION
C     XPRML        LOWER X COORDINATE LIMIT FOR  PARCEL  CONTRIBUTION
C     YPRML        LOWER Y COORDINATE LIMIT FOR  PARCEL  CONTRIBUTION
C     ASQ          SQUARE OF SEMI-AXIS A OF THE  PARCEL  CONTRIBUTION
C                  LIMIT ELLIPSE
C     BSQ          SQUARE OF SEMI-AXIS B OF THE  PARCEL  CONTRIBUTION
C                  LIMIT ELLIPSE
C     SINA         SIN     OF THE  ORIENTATION ANGLE OF THE A AXIS OF
C                  THE  PARCEL  CONTRIBUTION LIMIT ELLIPSE
C     COSA         COSINE OF THE  ORIENTATION ANGLE OF THE A AXIS OF
C                  THE  PARCEL  CONTRIBUTION LIMIT ELLIPSE
C     GAMA         LOG(BASE E) OF THE RATIO OF THE GAUSSIAN PARCEL
C                  CONTRIBUTION DISTRIBUTION MODE VALUE TO C..T
C     NC           COUNT OF AVAILABLE  PARCEL  STORAGE LOCA (   IN
C                  CORE.   THIS IS THE NUMBER OF  PARCELS   .J   'D
C                  IN PCHECK.
C     NIJ          A BLOCK COUNT OF DATA STORED ON TAPE AND/OR IN CORE
C     F            MAGNITUDE (I.E. INTEGRATED VALUE) OF A PARCEL
C                  PROPERTY  TO BE DISTRIBUTED ON THE MAP
C
C     ALSO SEE OPM1 GLOSSARY
C
C ******************************************************************
C
      COMMON /CONDAT/        IC(20)     ,IHOB       ,IPNCH      ,IPOUT     ,
     1ISIN       ,ISOUT      ,JPOUT      ,KPOUT      ,KTAPE      ,LTAPE     ,
     2MARRAY     ,MBTAPE     ,MXREQ      ,SD         ,INFAP
      COMMON /MAPDAT/ CAYF ,CUTMAP     ,DGX        ,DGY        ,IH   ,IV  ,
     1JC         ,NXMAP      ,NYMAP      ,NZ         ,QCUT       ,SSAM      ,
     2TGZ        ,XGZ        ,X1         ,X2         ,YGZ        ,XMAX      ,
     3XMIN       ,YMAX       ,YMIN       ,ZMIN
      COMMON /PARDAT/        ASQ        ,BSQ        ,COSA       ,F         ,
     1GAMA       ,KTR(100)   ,PMAS(100)  ,PSIZ(100)  ,RO(100)    ,SIGXO(100),
     2SIGYO(100),SINA        ,TPAR(100)  ,XPAR(100)  ,YPAR(100)  ,YPRML     ,
     3YPRMU      ,ZPAR(100)
      COMMON /RUNDAT/        C          ,CF6        ,FSUM       ,ICTR      ,
```

```
     1MAPRUN    ,NE          ,NIJ         ,NORD        ,NREG       ,NTASK
     2OPNID(12) ,T1          ,T2          ,WFMAS(200)
      COMMON /DECAY/ IGO,JD,KDOS,TENTER,TEXIT,TIME
      COMMON /OUTPUT/ FISNUM,FF(200),FW,NDSTR,JGC,MASCHN,PS(200),
     1 FMASS(200),DIAM(200)
      DIMENSION OMAP(NMAP)
      LOGICAL IGO,JD,KDOS
      DATA PROGRM/6HPCHECK/
C
      NE=0
      IF( IJIN.EQ.0) GO TO 50
      J=1
      IJIN=0
      NDSTP1=NDSTR+1
   50 DO 777 IP=1,NIJ
C
C     DETERMINE IF THE DEPOSIT INCREMENT IS GROUNDED
C
      IF((ZPAR(IP)-ZMIN).GT.10.0) GO TO 200
C     NREQ -  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15,
   75 GO TO(101,120,103,104,105,106,120,120,105,106,101,112,113,120,101,
     1       101,101,101),NREQ
C     NREQ - 16, 17, 18
C
C 101  COUNT OF GROUNDED WAFERS, OR MASS DEPOSITED, OR TIME OF ONSET
C     OR CESSATION, OR SMALLEST OR LARGEST PARTICLE SIZE.
  101 F=PMAS(IP)
      GO TO 100
C
C 103  DOSE RATE AT TIME T1 SECONDS
 103  IF(TPAR(IP) - T1)120,120,200
C
C 104 H+1 HR NORMALIZED DOSE RATE RESULTING FROM PARTICLES IN THE SIZE
C     RANGE T1 TO T2 MICROMETERS
  104 IF(PSIZ(IP) .GE. T1  .AND.  PSIZ(IP) .LE. T2) GO TO 120
      GO TO 200
C
C 105,106  DOSE ACCUMULATED FROM TIMES T1 TO INFINITY OR T2.
  106 IF(TPAR(IP) .GE. T2) GO TO 200
  105 IF(TPAR(IP) .GE. T1) GO TO 107
      TENTER=T1-TGZ
      C=CF6
      GO TO 120
  107 TENTER=TPAR(IP)-TGZ
      IF(NREQ .EQ. 9  .OR.  NREQ .EQ. 10) GO TO 120
      C=32.3344*(TENTER)**(-0.26)
      IF(NREQ .EQ. 6) C=C*(1.0 - (TENTER/TEXIT)**(0.26))
      GO TO 120
C
C 112 TOTAL PARTICLE MASS DEPOSITED BETWEEN TIMES T1 AND T2 SECONDS
  112 IF(TPAR(IP) .GE. T1  .AND.  TPAR(IP) .LE. T2) GO TO 101
      GO TO 200
C
C 113 MASS FROM PARTICLES IN THE SIZE RANGE T1 TO T2 MICROMETERS.
  113 IF(PSIZ(IP) .GE. T1  .AND.  PSIZ(IP) .LE. T2) GO TO 101
      GO TO 200
C
C 120 FIND INDEX OF PARTICLE SIZE CLASS
  120 IF(ICTR .NE. 0) GO TO 122
  121 IF(ABS(PSIZ(IP) - PS(J)) .LT. 1.0E-6) GO TO 125
```

```
      J=J+1
      IF(J.LE.NDSTR)GO TO 121
      CALL ERROR(PROGRM ,-120,ISOUT)
  122 DO 123  I=1,NDSTR
        K=NDSTP1-I
      IF(DIAM(K) .GE. PSIZ(IP)) GO TO 124
  123 CONTINUE
      CALL ERROR(PROGRM,-123,ISOUT)
  124 J=K
  125 IF(NREQ .EQ. 9  .OR.  NREQ .EQ. 13) CALL PAM2
      IF(NREQ.NE.14)GO TO 130
      F=FP( J )*PMAS(IP)/FMASS( J )/SSAM
      GO TO 100
  130 F=FP( J )*PMAS(IP)/WFMAS( J ) * C
C
C ******************************************************************************
C
  100 CONTINUE
C
C     COMPUTE GAMA AND DETERMINE THE LIMITING COORDINATES OF THE
C     PARTICLE CONTRIBUTION ELLIPSE
C
      IF(F.LT.QCUT) GO TO 200
      GAMA  = ALOG(F/SIGXO(IP)/SIGYO(IP)/QCUT/6.28318531)
      IF(GAMA.LT.0.0) GO TO 200
      COSA=COS(RO(IP))
      SINA=SIN(RO(IP))
      ASQ= 2.0*GAMA*SIGXO(IP)**2
      BSQ= 2.0*GAMA*SIGYO(IP)**2
      YPRMU = YPAR(IP) + SQRT(ASQ*SINA**2 + BSQ*COSA**2)
      YPRML = 2.0*YPAR(IP) - YPRMU
C
C     DOES THE PARTICLE CONTRIBUTE TO THE MAP WITHIN ITS VERTICAL
C     (Y AXIS) LIMITS -
C
      IF(YPRMU.GT.YMIN + DGY.AND.YPRML.LT.YMAX) GO TO 205
  200 KTR(IP)=1
      NE=NE+1
      GO TO 777
  205 XPRMU=XPAR(IP)+SQRT(ASQ*COSA**2 + BSQ*SINA**2)
C
C     DOES THE PARTICLE CONTRIBUTION LIE COMPLETELY BEYOND THE LEFT
C     BOUNDRY OF THIS MAP CORE LOAD -
C
      IF(XPRMU.LT.X1+DGX) GO TO 200
      XPRML = 2.0*XPAR(IP) - XPRMU
C
C     DOES THE PARTICLE CONTRIBUTION LIE COMPLETELY BEYOND THE RIGHT
C     BOUNDRY OF THIS MAP CORE LOAD -
C
      IF(XPRML.LT.X2) GO TO 220
      KTR(IP)=0
      GO TO 777
C
C     WILL THIS CONTRIBUTER ALSO CONTRIBUTE TO SUBSEQUENT MAP CORE LOADS
C
  220 IF(XPRMU.GT.X2) GO TO 230
      KTR(IP)=1
      NE=NE+1
      GO TO 240
```

```
  230 KTR(IP)=0
  240 CALL CALC(IP,OMAP,NMAP)
  777 CONTINUE
C
      RETURN
C
      END
```

```
*DECK,POMP
      SUBROUTINE POMP
C
C     THIS SUBROUTINE SORTS OUT THOSE  PARCELS  THAT WILL CONTRIBUTE
C     TO SUBSEQUENT MAP CORE LOADS, AND DUMPS THEM ON TO TAPE FOR
C     TEMPORARY STORAGE
C
C     H.G.NORMENT     JUNE 28,1971
C
C********************************** GLOSSARY **************************
C
C     JL             COUNT OF  PARCELS  MOVED FROM UPPER TO LOWER CORE
C                    (JL.LE.KP)
C     JP             COUNT OF AVAILABLE  PARCEL  STORAGE LOCATIONS PASSED
C                    IN THE  PARCEL  CORE STORAGE BLOCK SORT
C                    (JP.LE.NE.AND.JP.LE.KP)
C     KP             NUMBER OF  PARCELS  IN CORE THAT ARE TO BE DUMPED
C                    ONTO TAPE
C                    (KP=NIJ-NE)
C     NE             COUNT OF AVAILABLE  PARCEL  STORAGE LOCATIONS IN
C                    CORE.   THIS IS THE NUMBER OF  PARCELS  REJECTED
C                    IN PCHECK.
C     NIJ            A BLOCK COUNT OF DATA STORED ON TAPE AND/OR IN CORE
C
C     ALSO SEE OPM1 GLOSSARY
C
C ********************************************************************
C
      COMMON /CONDAT/       IC(20)    ,IHOB      ,IPNCH     ,IPOUT     ,
     1ISIN      ,ISOUT     ,JPOUT     ,KPOUT     ,KTAPE     ,LTAPE     ,
     2MARRAY    ,MBTAPE    ,MXREQ     ,SO        ,INFAM
      COMMON /PARDAT/       ASC       ,BSQ       ,COSA      ,F         ,
     1GAMA      ,KTR(100)  ,PMAS(100) ,PSIZ(100) ,PO(100)   ,SIGXO(100),
     2SIGYO(100),SINA      ,TPAR(100) ,XPAR(100) ,YPAR(100) ,YPRML     ,
     3YPRMU     ,ZPAR(100)
      COMMON /RUNDAT/       C         ,CF6       ,FSUM      ,ICTR      ,
     1MAPRUN    ,NE        ,NIJ       ,NORD      ,NREG      ,NTASK     ,
     2OPMID(12) ,T1        ,T2        ,WFMAS(200)
      DATA PROGRM/6HPOMP  /
C
      KP=NIJ-NE
      IF(NE.EQ.0) GO TO 1000
      JP=0
      M=NIJ+1
      J=1
      JL=0
C
C     SORT THROUGH THE STORED PARTICLE DATA BLOCK AND MOVE ALL
```

```
C      PARTICLE DATA TO BE DUMPED INTO LOWER CORE SO THAT IT IS
C      CONTAINED IN A SOLID DATA BLOCK (I.E. A DATA BLOCK WITH NO
C      REJECTED PARTICLES IN IT)
C
       DO 300 I=1,KP
       IF(KTR(I).EQ.0) GO TO 300
       JP=JP+1
       DO 200 K=J,NE
       L=M-K
       IF(KTR(L).EQ.1)GO TO 100
       JL=JL+1
       KK=K
C
C      MOVE  PARCEL  DATA TO AVAILABLE STORAGE IN LOWER CORE
C
       XPAR(I)=XPAR(L)
       YPAR(I)=YPAR(L)
       ZPAR(I)=ZPAR(L)
       TPAR(I)=TPAR(L)
       SIGXO(I)=SIGXO(L)
       SIGYO(I)=SIGYO(L)
       RO(I)=RO(L)
       PSIZ(I)=PSIZ(L)
       PMAS(I)=PMAS(L)
       GO TO 260
  100  JP=JP+1
  200  CONTINUE
  250  IRROR=-250
       GO TO 2000
  260  J=KK+1
  300  CONTINUE
       IF(JP.LE.NE) GO TO 500
  310  IRROR=-310
       GO TO 2000
  500  IF(JL.LE.KP)GO TO 1000
  510  IRROR=-510
 2000  CALL ERROR(PROGRM,IRROR,ISOUT)
 1000  WRITE(LTAPE)KP
       WRITE(LTAPE)(XPAR(I),YPAR(I),ZPAR(I),TPAR(I),SIGXO(I),SIGYO(I),
      1 RO(I),PSIZ(I),PMAS(I),I=1,KP)
       RETURN
       END
```

```
*DECK,SRTCNT
      SUBROUTINE SRTCNT( X, Y, CNT, K, CRDLBL)
C
C     H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - MARCH 1979
C
C ********************************************************************
C
C     GIVEN AN UNORDERED SET OF CONTOUR POINTS, THE POINTS ARE
C     SEQUENCED SUCH THAT EACH SUCCESSOR POINT IS THE CLOSEST POINT TO
C     ITS PREDECESSOR.  EACH CLOSED CONTOUR IS SEGREGATED.
C
C********************************* GLOSSARY ***************************
C
C         X,Y   -    POINT COORDINATES
C         CNT   -    CONTOUR VALUE
C         K     -    NUMBER OF POINTS
C         XX,YY-     FIRST POINT ON A CONTOUR
C         XP,YP-     MOST RECENTLY FOUND POINT ON A CONTOUR
C
C ********************************************************************
C
      COMMON /CONDAT/        IC(20)     ,IHOB       ,IPNCH      ,IPOUT      ,
     1ISIN       ,ISOUT      ,JPOUT      ,KPOUT      ,KTAPE      ,LTAPE      ,
     2MARRAY     ,MBTAPE     ,MXREQ      ,SO         ,INFAM
      DIMENSION X(300), Y(300)
      DATA CLR, PROGRM/ 1.E30, 6HSRTCNT/
      DATA CODE/ 6HDELFIC/
      VEC(A,B,C,D) = (A-C)**2 + (B-D)**2
      ILOOP=0
   40 IF( K .GT. 3) GO TO 55
      WRITE(ISOUT, 3000)
      DO 50 I=1,K
      WRITE( ISOUT, 1000) CNT,X(I), Y(I)
   50 IF(IPNCH .GT. 0) WRITE(IPNCH,2000)CNT, X(I),Y(I),CRDLBL, CODE
      IF(IPNCH .GT. 0) WRITE(IPNCH,2000)CNT, X(1),Y(1),CRDLBL, CODE
      WRITE(ISOUT, 1000)  CNT,X(1), Y(1)
      RETURN
CHECK POINTS AND REARRANGE IF NECESSARY TO AVOID A TWO-POINT CLOSURE
   55 ILOOP=ILOOP+1
      IF(ILOOP .GT. K) GO TO 100
      VEM=VEC(X(1),Y(1),X(2),Y(2))
      M=2
      DO 60 I=3,K
      IF(VEC(X(1),Y(1),X(I),Y(I)) .GT. VEM) GO TO 60
      M=I
      VEM=VEC(X(1),Y(1),X(I),Y(I))
   60 CONTINUE
      DO 65 I=2,K
      IF(I .EQ. M) GO TO 65
      IF(VEC(X(M),Y(M),X(I),Y(I)) .LE. VEM) GO TO 100
   65 CONTINUE
      XP=X(1)
      YP=Y(1)
      DO 70 I=2,K
      X(I-1)=X(I)
   70 Y(I-1)=Y(I)
      X(K)=XP
      Y(K)=YP
      GO TO 55
CCOMMENCE CALCULATION OF A CONTOUR CLOSURE
```

```
  100 XP = X(1)
      YP = Y(1)
      XX = X(1)
      YY = Y(1)
      KK = 1
      VEM = VEC(XP, YP, X(2), Y(2))
      M = 2
      WRITE(ISOUT, 3000)
      WRITE( ISOUT, 1000) CNT, XP, YP
      IF(IPNCH .GT. 0) WRITE(IPNCH,2000)CNT, XP,  YP,  CRDLBL, CODE
      L = 3
  600 DO 700 I=L,K
      IF(X(I) .EQ. CLR) GO TO 700
      IF( VEC( XP, YP, X(I), Y(I))  .GT. VEM) GO TO 700
      M = I
      VEM = VEC( XP, YP, X(I), Y(I))
  700 CONTINUE
  701 XP = X(M)
      YP = Y(M)
      X(M) = CLR
      WRITE( ISOUT, 1000) CNT, XP, YP
      IF(IPNCH .GT. 0) WRITE(IPNCH,2000)CNT, XP,  YP,  CRDLBL, CODE
  702 IF( VEC( XP, YP, XX, YY ) .EQ. 0.0) GO TO 750
      L= 1
      KK = KK + 1
  705 DO 710 I=1,K
      IF( X(I) .EQ. CLR) GO TO 710
      VEM= VEC( XP, YP, X(I), Y(I))
      M = I
      GO TO 600
  710 CONTINUE
      CALL ERROR( PROGRM, -710, ISOUT)
  750 IF( KK .EQ. K) RETURN
COMMENCE INITIALIZATION FOR ANOTHER CLOSURE.
CONDENSE REMAINING POINTS INTO LOWER CORE.
      KP=K-KK
      KKP=KP+1
      DO 770 I=1,KP
      IF(X(I) .NE. CLR) GO TO 770
      DO 760 J=KKP,K
      IF(X(J) .EQ. CLR) GO TO 760
      X(I)=X(J)
      Y(I)=Y(J)
      X(J)=CLR
      GO TO 768
  760 CONTINUE
  765 CALL ERROR(PROGRM,-765,ISOUT)
  768 KKP=J+1
  770 CONTINUE
      ILOOP=0
      K=KP
      GO TO 40
 1000 FORMAT( 5X, 3F10.0)
 2000 FORMAT( 3F10.0, 10X, A10, 10X, A6)
 3000 FORMAT(1H0)
      END
```

```
*DECK,PAM1
      SUBROUTINE PAM1
     1    (HOB    ,SLDTMP ,TMSD   ,TW ,EMITN, FISSID )
C
C      R C TOMPKINS -- US ARMY NUCLEAR DEFENSE LABS
C      TAPELESS VERSION   FEBRUARY 1970
C      OCTOBER 1966
C
C    EXECUTIVE PROGRAM FOR TIME-INDEPENDENT PART OF PARTICLE-ACTIVITY
C    MODULE
C
CALLED BY OPM1..............................
C
C  * * * * * * * * * * * * * * GLOSSARY * * * * * * * *
C
C    CAPFIS        CAPTURE-TO-FISSION RATIO
C    EMITN         NUMBER OF NEUTRONS EMITTED PER FISSION
C    FISSID        SIX CHARACTER IDENTIFIER OF FISSION TYPE
C    IFTAPE(10)    LOGICAL ARRAY TO CONTROL FILE MANIPULATION
C                  (1) TRUE - SET INTP NOT EQUAL TO ISIN
C                      FALSE - SET INTP = ISIN
C                  (2) TRUE - SET KRD = INTP
C                      FALSE - SET KRD = ISIN
C                  (3) TRUE - WRITE FILE IPAM
C                  (4) TRUE - READ FILE IPAM INTO MEMORY AND RETURN
C                  (5-10) SPARES
C    IPAM          BINARY FILE OF PAM1 OUTPUT FOR RESTARTS
C    ISIN          INPUT FILE (BCD) USED BY OTHER DELFIC MODULES
C    KOUT          BCD FILE OF PAM OUTPUT FOR PERIPHERAL PRINTING
C    KRD           INPUT FILE (BCD) CONTAINING SOIL PARAMETERS
C    NPRNT(20)     LOGICAL ARRAY TO CONTROL WRITING OF KOUT, TRUE = WRITE
C                  (1)  SETUP - TRANSITION CARDS (WARNING - PRODUCES SOME
C                            700 PAGES)
C                  (2)  SETUP - INTERMEDIATE FORM OF NUCLIDE TABLE (OCTAL
C                  (3)  SETUP - FINAL FORM OF NUCLIDE TABLE (OCTAL)
C                  (4)  YIELD - FISSION YIELD TABLE
C                  (5)  XPRM - EXPOSURE RATE MULTIPLIERS
C                  (6)  FRATIO - REFRACTORY FRACTIONS (FR)
C                  (7)  FRATIO - SQUARE ROOT OF FR (BSUBK)
C                  (8)  INDC01 - INFORMATION STORED FOR USE BY INDC02
C                  (9)  BATMAN - NUCLIDE ABUNDANCES (WARNING - THIS
C                       OPTION COMBINED WITH JO = FALSE WILL BURY YOU
C                       IN PAPER)
C                  (10) GXPSR - FISSION PRODUCT ACTIVITY VS PART SIZE
C                       (WARNING - SEE (9))
C                  (11) INDC02 - INDUCED ACTIVITY (SOIL) VS PART SIZE
C                       (WARNING - SEE (9))
C                  (12) URAN - INDUCED ACTIVITY (MASS 239) VS PART SIZE
C                       (WARNING - SEE (9))
C                  (13) MCHCEP - SELECTED MASS CHAIN ACTIVIY VS PART SIZE
C                  (14) SPARE
C                  (15) PAM2 - DO NOT WRITE TOTAL ACTIVITY VS PARTICLE
C                       SIZE (WARNING-SEE (9))
C                  (16-20) SPARES
C    PAMID(12)     RUN IDENTIFICATION FOR PARTICLE-ACTIVITY MODULE
C  * * *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
C
      COMMON /CONDAT/       IC(20)    ,IHOB      ,IPNCH     ,IPAM      ,
     1KRD      ,ISOUT     ,JPOUT     ,KPOUT     ,KTAPE     ,LTAPE     ,
     2MARRAY   ,MBTAPE    ,MXKEQ     ,SIGMA     ,INTF
```

```
      COMMON /DECAY/ IGO,JC,KDOS,TENTER,TEXIT,TIME
      COMMON /FISHIN/ ABEGN(700),ABUNDC(700),BRANCH(130),CAPFIS,
     1  DCON(700),IBRA,INUC,MAXNUC,MULT(11),NUCLID(700)
      COMMON /FRYLNG/ BSUBK(90),ERM(185),JRM(185),KKM,ECF(90)
      COMMON/INDUS/ALBFOM,FAC(7,18),FOGRNY(7,18),ISO(18),LM^X,XLAM(7,18)
      COMMON /OUTPUT/ FISNLM,FF(200),FW,ITAB,JGO,MASCHN,PSIZE(200),
     1 FMASS(200),PACT(200)
      COMMON /UTILTY/  KCUT,NPRNT(15)
      LOGICAL IGO,JD,KDOS,NPRNT
      INTEGER TYPE(12) , FISSID
      DATA TYPE/6HP239FI,6HP239HE,6HP239TH,6HU233FI,6HU233HE,6HU233TH,
     1          6HU235FI,6HU235HE,6HU235TH,6HU238FI,6HU238HE,6HU238TN/
C
      DATA (BRANCH(I),I=1,95   )/
     $ 6.000000E-1, 4.000000E-1, 3.600000E-1, 6.400000E-1, 5.000000E-1,
     $ 5.000000E-1, 6.000000E-2, 9.400000E-1, 4.400000E-1, 5.600000E-1,
     $ 1.000000E-1, 9.000000E-1, 1.900000E-1, 8.100000E-1, 3.000000E-2,
     $ 9.700000E-1, 7.000000E-2, 9.300000E-1, 1.180000E-1, 8.820000E-1,
     $ 1.500000E-1, 8.500000E-1, 6.000000E-1, 4.000000E-1, 2.500000E-1,
     $ 7.500000E-1, 2.000000E-2, 9.800000E-1, 9.600000E-1, 4.000000E-2,
     $ 8.700000E-1, 1.300000E-1, 5.000000E-1, 5.000000E-1, 9.950000E-1,
     $ 5.000000E-3, 2.060000E-1, 7.940000E-1, 5.000000E-1, 5.000000E-1,
     $ 5.000000E-1, 5.000000E-1, 5.000000E-1, 5.000000E-1, 1.000000E-2,
     $ 9.900000E-1, 6.800000E-1, 3.200000E-1, 5.000000E-1, 5.000000E-1,
     $ 9.000000E-1, 1.000000E-1, 5.000000E-1, 5.000000E-1, 7.200000E-1,
     $ 1.4[illegible]E-1, 1.430000E-1, 9.0[illegible]E-2, 9.100000E-1, 9.500000E-1,
     $ 5.000000E-2, 5.000000E-1, 5.000000E-1, 6.000000E-1, 1.000000E-1,
     $ 3.000000E-1, 2.190000E-1, 7.800000E-1, 1.000000E-3, 5.000000E-1,
     $ 5.000000E-1, 5.000000E-2, 5.000000E-1, 4.500000E-1, 5.000000E-1,
     $ 5.000000E-1, 3.000000E-2, 9.700000E-1, 5.000000E-1, 5.000000E-1,
     $ 5.000000E-1, 5.000000E-1, 2.150000E-1, 7.850000E-1, 9.900000E-1,
     $ 1.000000E-2, 5.000000E-1, 5.000000E-1, 2.200000E-1, 7.800000E-1,
     $ 9.800000E-1, 2.000000E-2, 9.700000E-1, 3.000000E-2, 6.500000E-2/
      DATA (BRANCH(I),I=96,130 )/
     $ 9.350000E-1, 1.730000E-1, 8.270000E-1, 6.800000E-1, 3.200000E-1,
     $ 9.000000E-1, 1.000000E-1, 1.500000E-1, 8.500000E-1, 2.000000E-1,
     $ 8.000000E-1, 8.000000E-3, 9.920000E-1, 7.200000E-1, 2.800000E-1,
     $ 1.300000E-1, 8.700000E-1, 2.400000E-2, 9.760000E-1, 3.000000E-1,
     $ 7.000000E-1, 4.000000E-2, 9.600000E-1, 9.200000E-1, 8.000000E-2,
     $ 3.000000E-2, 9.700000E-1, 4.000000E-2, 9.600000E-1, 7.500000E-1,
     $ 2.500000E-1, 7.300000E-1, 2.700000E-1, 0.000000   , 0.000000   /
      DATA (DCON  (I),I=1,95   )/
     $ 6.931470E+1, 1.980420E-1, 6.931470E-2, 4.140663E-6, 1.365538E-5,
     $ 0.000000   , 6.931470E+1, 3.465735E-1, 9.902100E-2, 5.776225E-3,
     $ 4.011267E-5, 1.307825E+0, 0.000000   , 6.931470E+1, 4.620980E-1,
     $ 1.732867E-1, 2.567211E-3, 1.481083E-3, 0.000000   , 6.931470E+1,
     $ 6.931470E+1, 2.772588E-1, 7.296284E-2, 5.776225E-3, 1.414586E-2,
     $ 1.408835E-4, 0.000000   , 6.931470E+1, 3.465735E-1, 8.664337E-2,
     $ 2.310490E-2, 0.000000   , 7.265692E-6, 0.000000   , 6.931470E+1,
     $ 4.620980E-1, 1.980420E-1, 4.620980E-2, 1.283606E-2, 1.739801E-5,
     $ 4.975215E-6, 0.000000   , 6.931470E+1, 6.931470E+1, 2.772588E-1,
     $ 8.664337E-2, 9.168611E-5, 1.925408E-3, 1.269500E-4, 0.000000   ,
     $ 6.931470E+1, 4.620980E-1, 1.540327E-1, 2.772588E-2, 1.283606E-3,
     $ 2.969781E-3, 3.660750E-13, 0.000000   , 6.931470E+1, 4.620980E-1,
     $ 2.310490E-1, 2.772588E-2, 1.925408E-2, 0.000000   , 6.931470E+1,
     $ 6.931470E+1, 3.465735E-1, 9.902100E-2, 2.104455E-2, 2.026746E-4,
     $ 6.418028E-4, 0.000000   , 6.931470E+1, 4.620980E-1, 1.386294E-1,
     $ 3.850817E-2, 0.000000   , 5.363254E-6, 0.000000   , 6.931470E+1,
     $ 6.931470E+1, 3.465735E-1, 9.902100E-2, 1.004561E-2, 4.620980E-4,
     $ 8.022535E-5, 1.013373E-4, 0.000000   , 6.931470E+1, 4.620980E-1,
```

```
$ 1.732867E-1, 3.850817E-3, 3.610141E-4, 0.000000    , 6.931470E+1/
 DATA (DCON  (I),I=96,190 )/
$ 6.931470E-1, 1.611970E+0, 1.777300E-2, 3.850817E-3, 4.375928E-5,
$ 2.072123E-9, 0.000000    , 6.931470E+1, 3.465735E-1, 4.332169E-2,
$ 1.155245E-2, 0.000000    , 1.110812E-2, 4.313191E-7, 0.000000    ,
$ 6.931470E+1, 4.620980E-1, 4.332169E-2, 1.271829E-2, 1.481083E-4,
$ 1.900511E-15, 0.000000    , 6.931470E+1, 6.931470E+1, 2.772588E-1,
$ 4.252436E-2, 6.876458E-5, 6.418028E-4, 0.000000    , 6.931470E+1,
$ 3.465735E-1, 1.575334E-1, 3.610141E-3, 7.501591E-4, 1.508621E-7,
$ 4.332169E-2, 0.000000    , 6.931470E+1, 6.931470E+1, 4.332169E-1,
$ 2.100445E-2, 4.278685E-3, 7.844465E-10, 2.994414E-6, 0.000000    ,
$ 6.931470E+1, 3.465735E-1, 6.931470E-2, 9.627042E-3, 1.984957E-5,
$ 2.31049[illegible]E-4, 1.0[illegible]E-7, 0.000000    , 6.93147[illegible]E+1, 4.620[illegible]E-1,
$ 2.310490E-1, 1.307825E-1, 7.131142E-5, 5.348356E-5, 0.000000    ,
$ 6.931470E+1, 6.931470E+1, 3.465735E-1, 1.237762E-1, 1.444056E-3,
$ 1.925408E-5, 2.312953E-14, 5.936352E-9, 0.000000    , 6.931470E+1,
$ 4.951050E-1, 2.310490E-1, 8.886500E-3, 5.776225E-4, 0.000000    ,
$ 6.931470E+1, 6.931470E+1, 3.465735E-1, 1.732867E-2, 1.155245E-3,
$ 1.234236E-7, 2.139343E-6, 2.292153E-7, 0.000000    , 6.931470E+1,
$ 6.931470E+1, 6.931470E-1, 2.772588E-1, 5.022804E-3, 0.000000    ,
$ 8.371341E-6, 0.000000    , 6.931470E+1, 6.931470E+1, 4.620980E-1/
 DATA (DCON  (I),I=191,285)/
$ 1.386294E-1, 1.132593E-5, 1.155245E-2, 1.586527E-4, 0.000000    ,
$ 6.931470E+1, 6.931470E+1, 6.931470E-1, 2.772588E-1, 1.155245E-2,
$ 2.265136E-4, 5.776225E-3, 0.000000    , 6.931470E+1, 6.931470E-1,
$ 4.620980E-1, 4.332169E-1, 5.022804E-3, 2.895351E-6, 3.209114E-5,
$ 1.045929E-13, 0.000000    , 6.931470E+1, 4.620980E-1, 1.980420E-1,
$ 3.850817E-3, 0.000000    , 4.332169E-2, 0.000000    , 6.931470E+1,
$ 6.931470E-1, 2.772588E-1, 1.155245E-2, 7.912637E-4, 8.251750E-4,
$ 0.000000    , 6.931470E+1, 6.931470E+1, 3.465735E-1, 9.902100E-2,
$ 1.034561E-3, 2.567211E-3, 1.386294E-1, 0.000000    , 6.931470E+1,
$ 4.620980E-1, 1.732867E-1, 2.772588E-2, 9.627042E-3, 2.020790E-7,
$ 2.026746E-4, 0.000000    , 6.931470E+1, 6.931470E+1, 2.310490E-1,
$ 4.620980E-3, 6.418028E-4, 0.000000    , 2.625557E-3, 1.650350E-2,
$ 0.000000    , 6.931470E+1, 6.931470E+1, 3.465735E-1, 5.776225E-3,
$ 1.283606E-3, 4.375928E-5, 1.824071E-2, 5.348356E-6, 0.000000    ,
$ 6.931470E+1, 6.931470E+1, 4.620980E-1, 1.732867E-1, 7.701633E-2,
$ 2.196450E-8, 8.751856E-5, 2.310490E-2, 0.000000    , 6.931470E+1,
$ 6.931470E-1, 2.772588E-1, 1.155245E-2, 2.511400E-3, 1.540327E-2,
$ 5.251114E-4, 3.277726E-15, 0.0[illegible]    , 6.931470E+1, 6.931470E+1,
$ 3.465735E-1, 1.155245E-2, 2.666616E-3, 3.850817E-2, 0.000000    /
 DATA (DCON  (I),I=286,380)/
$ 6.931470E+1, 6.931470E+1, 4.620980E-1, 2.772588E-1, 4.332169E-2,
$ 1.386294E-2, 2.310490E-2, 2.457956E-3, 1.375292E-5, 1.777300E-2,
$ 0.000000    , 6.931470E+1, 6.931470E-1, 3.465735E-1, 6.931470E-2,
$ 1.386294E-1, 0.000000    , 6.931470E+1, 6.931470E+1, 4.620980E-1,
$ 1.732867E-1, 5.776225E-2, 3.500742E-5, 5.022804E-4, 9.360851E-3,
$ 1.055597E-6, 0.000000    , 6.931470E+1, 4.620980E-1, 2.310490E-1,
$ 9.902100E-2, 9.168611E-6, 6.016901E-5, 0.000000    , 6.931470E+1,
$ 6.931470E+1, 3.465735E-1, 1.732867E-1, 8.251750E-3, 9.627042E-3,
$ 3.632846E-5, 0.000000    , 6.931470E+1, 6.931470E+1, 4.620980E-1,
$ 2.310490E-1, 4.813521E-3, 1.386294E-1, 0.000000    , 6.931470E+1,
$ 6.931470E-1, 2.772588E-1, 1.540327E-2, 3.465735E-2, 5.501167E-4,
$ 1.855706E-7, 3.632846E-6, 4.263130E-5, 1.000000E-15, 0.000000    ,
$ 6.931470E+1, 6.931470E+1, 3.465735E-1, 6.931470E-2, 4.620980E-3,
$ 0.000000    , 6.931470E+1, 6.931470E+1, 4.620980E-1, 1.386294E-1,
$ 1.050223E-2, 6.418028E-5, 2.310490E-4, 9.627042E-5, 2.567211E-4,
$ 5.730382E-7, 0.000000    , 6.931470E+1, 4.620980E-1, 1.540327E-1,
$ 2.772588E-2, 2.310490E-4, 2.567211E-3, 1.386294E-1, 0.000000    ,
$ 6.931470E+1, 4.620980E-1, 2.310490E-1, 4.077335E-2, 4.278685E-3,
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$ 1.216047E-3, 6.418028E-4, 5.776225E-3, 3.274534E-6, 0.000000    / PAM1 181
 DATA (DCON  (I),I=381,475)/                                        PAM1 182
$ 6.931470E+1, 3.465735E-1, 1.155245E-1, 9.627042E-4, 1.386294E-2, PAM1 183
$ 0.000000   , 6.931470E+1, 4.620980E-1, 1.732867E-1, 6.931470E-2, PAM1 184
$ 3.726597E-3, 2.310490E-2, 6.786801E-10, 7.131142E-6, 0.000000   ,PAM1 185
$ 4.620980E-1, 2.310490E-1, 1.732867E-2, 1.540327E-2, 0.000000   , PAM1 186
$ 2.783723E-3, 2.865191E-6, 0.000000   , 6.931470E+1, 2.772588E-1, PAM1 187
$ 7.701633E-2, 1.925408E-2, 6.931470E-2, 6.416028E-6, 2.817671E-4, PAM1 188
$ 0.000000   , 6.931470E+1, 3.465735E-1, 6.931470E-2, 3.465735E-2, PAM1 189
$ 0.000000   , 5.501167E-4, 8.886500E-3, 1.337089E-7, 0.000000   , PAM1 190
$ 3.465735E-1, 1.386294E-1, 4.620980E-2, 1.190974E-3, 8.534611E-7, PAM1 191
$ 8.135001E-9, 1.383196E-7, 0.000000   , 6.931470E+1, 2.310490E-1, PAM1 192
$ 9.902100E-2, 1.098225E-13, 6.080237E-4, 6.416028E-7, 0.000000   ,PAM1 193
$ 6.931470E+1, 4.620980E-1, 2.310490E-1, 2.750593E-3, 8.557370E-5, PAM1 194
$ 2.061465E-6, 7.640509E-8, 2.070332E-5, 0.000000   , 6.931470E-1, PAM1 195
$ 3.465735E-1, 2.026746E-4, 1.050223E-3, 2.238847E-5, 0.000000   , PAM1 196
$ 4.620980E-4, 0.000000   , 6.931470E+1, 4.620980E-1, 1.069671E-4, PAM1 197
$ 4.195670E-5, 1.956716E-7, 1.604507E-4, 1.372781E-15, 1.002817E-6,PAM1 198
$ 0.000000   , 6.931470E+1, 4.620980E-1, 4.443250E-3, 1.925408E-3, PAM1 199
$ 3.122284E-4, 0.000000   , 1.540327E-5, 0.000000   , 6.931470E+1, PAM1 200
$ 6.931470E-1, 1.050223E-2, 5.954871E-4, 6.416028E-6, 4.813521E-4/ PAM1 201
 DATA (DCON  (I),I=476,570)/                                        PAM1 202
$ 9.965882E-7, 6.685446E-7, 0.000000   , 6.931470E+1, 6.931470E+1, PAM1 203
$ 1.386294E-2, 3.690879E-3, 2.466472E-6, 8.371340E-5, 0.000000   , PAM1 204
$ 6.931470E+1, 1.777300E-2, 4.375928E-3, 2.310490E-4, 9.241960E-4, PAM1 205
$ 9.256771E-6, 3.488059E-6, 1.522303E-6, 0.000000   , 6.931470E+1, PAM1 206
$ 6.931470E+1, 4.620980E-1, 2.750583E-4, 2.179708E-4, 0.000000   , PAM1 207
$ 6.639339E-5, 9.983665E-9, 0.000000   , 6.931470E+1, 3.648142E-1, PAM1 208
$ 8.251750E-3, 2.873744E-5, 7.550621E-4, 2.692835E-5, 1.098225E-14,PAM1 209
$ 0.000000   , 2.310490E-1, 1.155245E-1, 6.251169E-3, 0.000000   , PAM1 210
$ 6.171180E-7, 0.000000   , 6.931470E+1, 2.310490E-1, 2.840766E-2, PAM1 211
$ 2.962167E-3, 7.522090E-10, 4.443250E-3, 0.000000   , 6.931470E+1,PAM1 212
$ 3.465735E-1, 1.100233E-1, 8.251750E-4, 3.587717E-4, 0.000000   , PAM1 213
$ 1.000200E-15, 0.000000   , 6.931470E+1, 3.465735E-1, 1.690602E-2,PAM1 214
$ 1.216047E-3, 1.359112E-4, 0.000000   , 6.931470E+1, 4.620980E-1, PAM1 215
$ 4.332169E-2, 1.050223E-2, 6.267605E-7, 4.789573E-6, 0.000000   , PAM1 216
$ 6.931470E+1, 4.077235E-1, 2.772598E-2, 6.416028E-4, 5.060564E-5, PAM1 217
$ 2.431071E-7, 0.000000   , 6.931470E+1, 4.620980E-1, 6.664337E-2, PAM1 218
$ 1.155245E-3, 1.375292E-4, 0.000000   , 6.931470E+1, 6.931470E-1, PAM1 219
$ 3.465735E-1, 5.331900E-2, 6.418028E-4, 5.834571E-6, 5.813431E-7, PAM1 220
$ 0.000000   , 6.931470E+1, 4.620980E-1, 1.980425E-1, 4.620980E-2/ PAM1 221
 DATA (DCON  (I),I=571,665)/                                        PAM1 222
$ 2.814924E-6, 6.677727E-4, 0.000000   , 6.931470E+1, 6.931470E-1, PAM1 223
$ 3.465735E-1, 7.701633E-2, 3.850817E-3, 3.219746E-5, 0.000000   , PAM1 224
$ 6.931470E+1, 6.931470E+1, 4.620980E-1, 1.732867E-1, 8.311115E-4, PAM1 225
$ 4.734611E-4, 0.000000   , 6.931470E+1, 6.931470E-1, 3.465735E-1, PAM1 226
$ 9.627042E-3, 9.627042E-4, 7.227590E-7, 6.447068E-9, 0.000000   , PAM1 227
$ 6.931470E+1, 6.931470E-1, 3.465735E-1, 1.732867E-2, 5.924333E-3, PAM1 228
$ 0.000000   , 1.485655E-6, 0.000000   , 6.931470E+1, 4.620980E-1, PAM1 229
$ 1.980420E-1, 2.310490E-2, 9.627042E-5, 3.626004E-6, 0.000000   , PAM1 230
$ 6.931470E+1, 4.620980E-1, 2.772588E-1, 4.620980E-2, 0.000000   , PAM1 231
$ 7.131142E-5, 0.000000   , 6.931470E-1, 3.465735E-1, 9.902100E-2, PAM1 232
$ 8.886500E-4, 6.779607E-6, 2.745553E-10, 0.000000   , 6.931470E+1,PAM1 233
$ 4.620980E-1, 1.386294E-1, 3.850817E-3, 1.925408E-3, 0.000000   , PAM1 234
$ 2.070332E-5, 1.669577E-9, 0.000000   , 6.931470E+1, 4.620980E-1, PAM1 235
$ 2.310490E-1, 3.950817E-2, 2.100445E-3, 4.096613E-6, 0.000000   , PAM1 236
$ 6.931470E-1, 3.465735E-1, 5.776225E-2, 4.620980E-3, 0.000000   , PAM1 237
$ 1.372781E-9, 0.000000   , 6.931470E+1, 3.465735E-1, 1.386294E-1, PAM1 238
$ 1.155245E-2, 4.813521E-4, 1.292030E-8, 0.000000   , 4.620980E-1, PAM1 239
$ 1.540327E-1, 2.772588E-2, 1.925408E-5, 5.209438E-7, 0.000000   , PAM1 240
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$ 6.931470E+1, 2.310490E-1, 5.331900E-2, 2.310490E-2, 1.283606E-5/ PAM1 241
 DATA (DCON  (I),I=666,700)/                                        PAM1 242
$ 0.000000   , 6.931470E+1, 3.465735E-1, 1.155245E-1, 7.701633E-4, PAM1 243
$ 1.925408E-4, 0.000000   , 4.620980E-1, 1.980420E-1, 4.951050E-2, PAM1 244
$ 5.776225E-4, 1.069671E-5, 0.000000   , 6.931470E+1, 2.772588E-1, PAM1 245
$ 4.620980E-2, 4.620980E-3, 0.000000   , 1.098977E-7, 0.000000   , PAM1 246
$ 6.931470E+1, 3.465735E-1, 1.732867E-1, 3.150668E-2, 3.122284E-3, PAM1 247
$ 1.162686E-6, 0.000000   , 0.000000   , 0.000000   , 0.000000   , PAM1 248
$ 0.000000   , 0.000000   , 0.000000   , 0.000000   , 0.000000   / PAM1 249
 DATA (ERM   (I),I=1,95   )/                                        PAM1 250
$-8.400000E-7, 1.170000E-5,-1.890000E-6, 7.790000E-8,-3.650000E-6, PAM1 251
$ 1.800000E-5,-3.030000E-7, 1.990000E-7,-2.100000E-6,-4.040000E-7, PAM1 252
$ 5.740000E-6, 5.530000E-8,-2.430000E-6, 2.710000E-6, 4.280000E-6, PAM1 253
$-1.040000E-7,-1.150000E-7,-1.430000E-5,-6.660000E-7, 1.490000E-5, PAM1 254
$ 2.770000E-7, 2.320000E-7,-9.170000E-6,-9.090000E-7, 2.770000E-8, PAM1 255
$-2.990000E-6, 4.750000E-7,-4.100000E-6,-7.680000E-6, 3.120000E-6, PAM1 256
$-1.690000E-5, 1.100000E-5,-8.990000E-6,-4.180000E-6, 2.820000E-6, PAM1 257
$ 1.730000E-8,-5.880000E-6, 1.220000E-6,-1.140000E-6, 4.860000E-7, PAM1 258
$ 1.660000E-7,-3.480000E-6,-3.780000E-6, 1.330000E-6, 3.910000E-6, PAM1 259
$-1.150000E-5,-2.380000E-7, 3.820000E-6, 3.500000E-6,-6.580000E-7, PAM1 260
$ 7.450000E-7,-6.370000E-6,-7.920000E-6, 1.930000E-6,-5.350000E-6, PAM1 261
$-2.610000E-6, 1.220000E-7,-2.150000E-7, 3.000000E-6,-3.860000E-6, PAM1 262
$ 4.170000E-7, 1.750000E-7,-6.660000E-6, 1.480000E-6,-1.220000E-6, PAM1 263
$ 1.740000E-6,-2.650000E-7, 2.360000E-6,-6.370000E-7, 6.910000E-7, PAM1 264
$ 1.690000E-7, 8.050000E-8,-3.400000E-7, 8.900000E-7, 3.770000E-7, PAM1 265
$ 1.310000E-7,-1.250000E-7, 3.240000E-6,-1.770000E-7, 1.040000E-6, PAM1 266
$ 1.020000E-6,-6.430000E-6,-7.080000E-6, 5.250000E-7, 3.850000E-6, PAM1 267
$ 1.220000E-6,-1.160000E-6,-2.690000E-7, 4.070000E-6, 1.470000E-7, PAM1 268
$-2.710000E-6,-4.690000E-6,-4.840000E-7, 2.020000E-6,-5.350000E-6/ PAM1 269
 DATA (ERM   (I),I=96,185 )/                                        PAM1 270
$ 1.050000E-7, 8.320000E-7,-8.960000E-6,-1.960000E-6, 3.980000E-7, PAM1 271
$ 2.540000E-6, 3.270000E-7,-9.390000E-6,-2.710000E-6, 2.630000E-6, PAM1 272
$ 5.140000E-7, 2.340000E-8,-2.390000E-6, 9.280000E-6, 4.900000E-7, PAM1 273
$-5.400000E-6, 1.830000E-7, 1.250000E-6, 4.300000E-7,-7.840000E-6, PAM1 274
$-3.180000E-6, 9.300000E-6, 2.130000E-6, 2.210000E-6, 1.980000E-7, PAM1 275
$-1.440000E-6, 1.120000E-5,-1.120000E-5, 7.840000E-6, 3.140000E-6, PAM1 276
$ 3.840000E-7, 3.060000E-7,-6.940000E-6, 1.220000E-5, 7.540000E-7, PAM1 277
$ 8.130000E-6,-1.560000E-5, 2.390000E-6, 1.490000E-6,-1.210000E-5, PAM1 278
$ 1.170000E-5,-3.180000E-6,-4.410000E-6, 9.790000E-6,-1.400000E-6, PAM1 279
$ 1.100000E-6, 2.550000E-7,-3.230000E-6, 1.160000E-6, 1.140000E-5, PAM1 280
$-3.650000E-6, 1.270000E-7, 4.670000E-7,-4.950000E-6, 6.010000E-6, PAM1 281
$-5.740000E-6, 3.500000E-6,-1.230000E-7, 1.400000E-7,-3.650000E-6, PAM1 282
$ 4.390000E-6,-1.500000E-6, 6.530000E-6,-9.600000E-7,-5.280000E-6, PAM1 283
$-1.220000E-6, 2.800000E-8,-8.080000E-6,-5.600000E-6, 1.290000E-6, PAM1 284
$-3.430000E-6, 1.920000E-6, 5.800000E-6,-8.040000E-7, 1.850000E-7, PAM1 285
$-6.010000E-6,-7.260000E-7, 2.890000E-7,-3.020000E-6,-3.360000E-6, PAM1 286
$-2.710000E-6, 6.300000E-6,-3.950000E-7,-2.020000E-6,-2.030000E-6, PAM1 287
$ 2.430000E-7, 0.000000   , 0.000000   , 0.000000   , 0.000000   / PAM1 288
 DATA ((FAC   (I,J),I=1,7),J= 1,13)/                                PAM1 289
$ 1.001878E-2, 1.469053E-1, 3.249960E-3, 2.154768E-4, 0.000000   , PAM1 290
$ 0.000000   , 0.000000   , 0.000000   , 0.000000   , 0.000000   , PAM1 291
$ 0.000000   , 0.000000   , 0.000000   , 0.000000   , 4.828905E-2, PAM1 292
$ 8.614628E-3, 2.225009E-3, 0.000000   , 0.000000   , 0.000000   , PAM1 293
$ 0.000000   , 8.997160E-2, 6.149802E-4, 3.224437E-3, 0.000000   , PAM1 294
$ 0.000000   , 0.000000   , 0.000000   , 2.714157E-3, 0.000000   , PAM1 295
$ 0.000000   , 0.000000   , 0.000000   , 0.000000   , 0.000000   , PAM1 296
$ 7.495138E-3, 0.000000   , 0.000000   , 0.000000   , 0.000000   , PAM1 297
$ 0.000000   , 0.000000   , 2.399311E-4, 7.541378E-4, 3.604457E-2, PAM1 298
$ 6.379338E-4, 4.555539E-5, 0.000000   , 0.000000   , 5.779001E-1, PAM1 299
$ 1.497511E-7, 0.000000   , 0.000000   , 0.000000   , 0.000000   , PAM1 300
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$ 0.000000    , 1.166825E-2, 1.540214E-2, 8.675678E-4, 1.191251E-4, PAM1 301
$ 0.000000    , 0.000000    , 0.000000    , 1.969533E-2, 8.119759E-5, PAM1 302
$ 0.000000    , 0.000000    , 0.000000    , 0.000000    , 0.000000    , PAM1 303
$ 0.000000    , 0.000000    , 0.000000    , 0.000000    , 0.000000    , PAM1 304
$ 0.000000    , 0.000000    , 8.025837E-3, 0.000000    , 0.000000    , PAM1 305
$ 0.000000    , 0.000000    , 0.000000    , 0.000000    , 1.346556E-3, PAM1 306
$ 1.559918E-3, 1.911186E-4, 0.000000    , 0.000000    , 0.000000    , PAM1 307
$ 0.000000    /                                                       PAM1 308
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$ 0.000000    , 0.000000    , 0.000000    , 4.538654E-4, 0.000000    , PAM1 315
$ 0.000000    , 0.000000    , 0.000000    , 0.000000    , 0.000000    / PAM1 316
 DATA ((FOGRNY(I,J),I=1,7),J=1,13 )/                                  PAM1 317
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$ 0.000000    , 4.546000E-6, 0.000000    , 0.000000    , 0.000000    , PAM1 335
$ 0.000000    /                                                       PAM1 336
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$ 0.000000    , 0.000000    , 0.000000    , 6.620000E-6, 0.000000    , PAM1 339
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$         56,         70,         78,         84,         85, PAM1 378
$         86,         87,         93,        100,        101, PAM1 379
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$        147,        153,        154,        160,        161, PAM1 382
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$        186,        192,        193,        194,        209, PAM1 384
$        210,        218,        224,        225,        232, PAM1 385
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$        384,        392,        401,        402,        408/ PAM1 393
 DATA (JRM    (I),I=96,185 )/                                        PAM1 394
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$        483,        486,        489,        490,        491, PAM1 400
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     $-20417647650,-20417618466, 20417871876,-20550258692, 20550520836,
     $ 20550782980, 20551045124, 20551307268, 20551569412, 20551827460,
     $-20684738564, 20685000708, 20685262852, 20685524996, 20685783044,
     $-20686049284, 20686307332,-20818956292, 20819218436, 20819480580,
     $ 20819742724, 20820004868, 20820267012, 20820525060,-20953436164,
     $ 20953698308, 20953960452, 20954222596, 20954484740, 20954742788,
     $-21087653892, 21087916036, 21088178180, 21088440324, 21088702468/
      DATA (NUCLID(I),I=666,700)/
     $ 21088960516,-21221871620, 21222133764, 21222395908, 21222658052,
     $ 21222920196, 21223178244,-21356351492, 21356613636, 21356875780,
     $ 21357137924, 21357400068, 21357658116,-21490569220, 21490831364,
     $ 21491093508, 21491355652, 21491613700,-21491879940, 21492137988,
     $-21624786948, 21625049092, 21625311236, 21625573380, 21625835524,
     $ 21626097668, 21626355716,           0,           0,           0,
     $           0,           0,           0,           0,           0/
      DATA (MULT  (I),I=1,11   )/
     $           8,          64,         512,        4096,       32768,
     $      262144,     2097152,    16777216,   134217728,  1073741824,
     $  8589934592/
      DATA IBRA,INUC,KRM,LMAX,MAXNUC/
     $         128,         692,         181,          18,         700/
C***********************************************************************
C
   13 FORMAT(A6)
   14 FORMAT((5E14.6))
C
C     SEARCH FOR KIND OF FISSION TO USE
C
      DO 300 I=1,12
      IF (FISSID.EQ.TYPE(I)) GO TO 305
300   CONTINUE
C
C     FISSION TYPE REQUESTED IS NOT IN TABLE--PRINT ERROR
C
      WRITE (KOUT,6000) FISSID
 6000 FORMAT(1H0, 17HFISSION DATA FOR A6, 30H TYPE FISSION IS NOT AVAILA
     1BLE)
      CALL ERROR(6H PAM1 ,-6000, ISOUT)
C
C     TYPE FISSION REQUESTED FOUND IN TABLES
C
C     LOAD THIS DATA INTO ABEGN
C
C
 305  CONTINUE
C
C     LOAD TAPE  DATA FOR REQUESTED FISSION TYPE INTO ABEGN
C
      DO 306 I=1,12
      READ(INTP,13) NAME
```

```
      IF(EOF(INTP) .NE. 0.0)  GO TO 307
      READ(INTP,14) (ABEGN(J),J=1,692)
        IF(NAME .EQ. FISSID) GO TO 308
  306 CONTINUE
  307 CONTINUE
      WRITE(KOUT,6001) FISSID
 6001 FORMAT( 1H0,  8H FISSID=A6, 18H NOT FOUND IN FILE)
       CALL ERROR(6H PAM1 ,-6001, ISOUT)
  308 REWIND INTP
      HSCL=HOB/TW**0.33333333
      IF (EMITN.LE.0.0) GO TO 100
C
C     CONVERT HOB FROM METERS TO FEET.
C
      HOB=HOB*3.28084
      HSCL=HSCL*3.28084
      IF (HSCL.LT.36.0) GO TO 274
      ALBFOM=0.0
      GO TO 287
  274 IF (HSCL)276,277,275
  275 FOM=1.-HSCL/SQRT(4.24*HSCL*HSCL-234.*HSCL+4225.)
      GO TO 286
  276 IF (HSCL.LT.-2.0) GO TO 278
  277 FOM=1.0
      GO TO 286
  278 ALBFOM = 1.E4
      GO TO 287
  286 ALBFOM = ALBFOM*FOM
  287 ALBFOM = ALBFOM*EMITN
      GO TO 101
  100 LMAX= 0
  101 CONTINUE
      CALL FRATIO
     1    (SLOTMP ,TMSD   ,MCHN    )
      RETURN
      END
```

```
*DECK,PAM2
      SUBROUTINE PAM2
C
C      R C TOMPKINS -- US ARMY NUCLEAR DEFENSE LABS
C    EXECUTIVE PROGRAM FOR THE TIME-DEPENDENT PART OF THE PARTICLE
C      OCTOBER 1966
C    ACTIVITY MODULE
CALLED BY OPM2 AND PCHECK
C
C  *  *  *  *  *  *  *  *  *  *   GLOSSARY  *  *  *  *  *  *  *  *  *  *  *
C
C    FP(200)        ACTIVITY DENSITY IN EACH PARTICLE SIZE FRACTION
C    ITAB           NUMBER OF PARTICLE SIZE CLASSES
C    MASCHN         MASS NUMBER REQUESTED FOR OUTPUT WITH JGO = 2
C    SV(200)        FRACTION OF TOTAL SURFACE IN EACH PARTICLE SIZE CLASS
C                   DIVIDED BY FRACTION OF TOTAL VOLUME
C
C  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
C
      COMMON /DECAY/ IGO,JC,KDOS,TENTER,TEXIT,TIME
      COMMON /FISHIN/ ABEGN(700),ABUNDO(700),BRANCH(130),CAPFIS,
     1  DCON(700),IBRA,INUC,MAXNUC,MULT(11),NUCLID(700)
      COMMON/INDUS/ALBFOM,FAC(7,18),FOGRNY(7,18),ISO(18),LMAX,XLAM(7,18)
      COMMON /OUTPUT/ FISNUM,FF(200),FW,ITAB,JGO,MASCHN,PSIZE(200),
     1 FMASS(200),PACT(200)
      COMMON /UTILTY/  KOUT,NPRNT(15)
      LOGICAL IGO,JD,KDOS,NPRNT
C
  100 FORMAT( ////35X, 51HTABLE OF TOTAL ACTIVITY IN EACH PARTICLE SIZE
     1CLASS//   4(6X, 5HPSIZE, 10X, 2HFP, 5X))
  101 FORMAT( 8(1PE14.4))
  102 FORMAT(1H03X40HK FACTORS COMPUTED FROM THE FP TABLE -   ,   1PE11.4
     1,27X,1PE11.4)
  103 FORMAT(1H+, 55X, 16H(R-M**2)/(HR-KT), 22X, 17H(R-MI**2)/(HR-KT))
  104 FORMAT(1H+, 55X, 11H(R-M**2)/KT, 27X, 12H(R-MI**2)/KT)
C
      DO 10I = 1,200
   10 FP(I) = 0.0
C
      GO TO (1,2,3), JGO
C
    1 CALL GXPSR
      IF (CAPFIS)3,3,4
    4 CALL URAN
    3 IF (LMAX)5,5,6
    6 CALL INDCC2
    5 IF(NPRNT(15)) RETURN
      NTAB=ITAB/4
      IF(NTAB*4 .LT. ITAB)NTAB=NTAB+1
      WRITE (KOUT,100)
      WRITE (KOUT,101) (PSIZE(I),FP(I),PSIZE(I+NTAB),FP(I+NTAB),
     1 PSIZE(I+2*NTAB),FF(I+2*NTAB),PSIZE(I+3*NTAB),FP(I+3*NTAB),I=1,
     2 NTAB)
      IF(JGO .EQ. 2) RETURN
      CAYFAC= 1.0
      DO 7 I=1,ITAB
    7 CAYFAC=CAYFAC+FP(I)
      CAYFAC=CAYFAC/FW
      CAYFA =CAYFAC*3.661E-7
      WRITE(KOUT,102) CAYFAC,CAYFA
```

```
      IF(JD) WRITE( KOUT,103)
      IF(.NOT. JD) WRITE( KOUT,104)
      RETURN
    2 CALL MCHDEP
      GO TO 5
      END
```

```
*DECK,FRATIO
      SUBROUTINE FRATIO
     1     (SLDTMP,TMSD,MCHN)
C
C     R C TOMPKINS -- US ARMY NUCLEAR DEFENSE LABS
C     SEPTEMBER 1966
C     REVISED NOVEMBER 1974
C
      COMMON /DECAY/ IGO,JD,KDOS,TENTER,TEXIT,TIME
      COMMON /FISHIN/ ABEGN(700),ABUNDO(700),BRANCH(130),CAPFIS,
     1  DCON(700),IBRA,INUC,MAXNUC,MULT(11),NUCLID(700)
      COMMON /FRYLNG/ BSUBK(90),ERM(185),JRM(185),KRM,ECF(90)
      COMMON /OUTPUT/ FISNUM,FF(200),FW,ITAB,JGO,HASCHN,PSIZE(200),
     1 FMASS(200),PACT(200)
      COMMON /UTILTY/  KOUT,NPRNT(15)
      LOGICAL IGO,JD,KDOS,NPRNT
      DIMENSION FR(90)
      DIMENSION BOIL(40)
C
      EQUIVALENCE (FR,BSUBK)
C
      LOGICAL NOTO
C
      DATA BOIL/2*3173.0,2907.0,3000.0,2976.0,1754.0,1010.0,1026.0,331.8
     1,120.1,1650.0,3497.0,4695.0,4808.0,3300.0,1351.0,583.0,4505.0,4149
     2.0,3436.0,2451.0,1832.0,2123.0,2247.0,1832.0,1534.0,457.4,165.9,15
     355.0,3003.0,4608.0,4367.0,4252.0,4464.0,4348.0,5*4300.0/
C
C
      TIME = TMSD
      IGO = .FALSE.
      JD = .TRUE.
      KDOS = .FALSE.
      MAXCHN = 90
      DO 30 I = 1,MAXCHN
   30 FR(I) = 0.0
C
      CALL BATMAN
C
      MCHN = 0
      RFRC = 0.0
      CHN = 0.0
      LAST = IABS(NUCLID(1))/MULT(9)
      NOTO = .FALSE.
C
      DO 10 MB = 1,INUC
      NAME = IABS(NUCLID(MB))/MULT(6)
      MASS = NAME/MULT(3)
      NAT = MOD(NAME,MULT(3))
```

```
      IF (NAT.GE.27.AND.NAT.LE.66) GO TO 1                              FRATI 50
      WRITE (KOUT,513) NAT,MASS                                         FRATI 51
      ABUND = 0.0                                                       FRATI 52
      GO TO 10                                                          FRATI 53
    1 IF (MASS.EQ.LAST)GO TO 3                                          FRATI 54
      MCHN = MCHN + 1                                                   FRATI 55
      IF (NOTO) FR(MCHN) = RFRC/CHN                                     FRATI 56
      RFRC = 0.0                                                        FRATI 57
      CHN = 0.0                                                         FRATI 58
      NOTO = .FALSE.                                                    FRATI 59
    3 ABUND = ABUNDO(MB)                                                FRATI 60
      LAST = MASS                                                       FRATI 61
      IF (ABUND)10,10,4                                                 FRATI 62
    4 NOTO = .TRUE.                                                     FRATI 63
      IF (BOIL(NAT-26).GE.SLOTMP) RFRC = RFRC + ABUND                   FRATI 64
      CHN = CHN + ABUND                                                 FRATI 65
   10 CONTINUE                                                          FRATI 66
      MCHN = MCHN + 1                                                   FRATI 67
      IF (NOTO) FR(MCHN) = RFRC/CHN                                     FRATI 68
C                                                                       FRATI 69
      IF (NPRNT(6)) GO TO 22                                            FRATI 70
   19 DO 32 L = 1,MCHN                                                  FRATI 71
      BSUBK(L) = SQRT(FR(L)) - 1.0                                      FRATI 72
      POWER = BSUBK(L)                                                  FRATI 73
      SUM = 0.0                                                         FRATI 74
      DO 20 M = 1,ITAB                                                  FRATI 75
   20 SUM = SUM + FMASS(M)*PSIZE(M)**POWER                              FRATI 76
   32 ECF(L) = 1.0/SUM                                                  FRATI 77
      IF (NPRNT(7)) GO TO 23                                            FRATI 78
   21 IGO = .TRUE.                                                      FRATI 79
      RETURN                                                            FRATI 80
   22 WRITE (KOUT,501)                                                  FRATI 81
      WRITE (KOUT,502) (J,FR(J),J=1,MCHN)                               FRATI 82
      GO TO 19                                                          FRATI 83
   23 WRITE (KOUT,503)                                                  FRATI 84
      WRITE (KOUT,502) (K,BSUBK(K),K=1,MCHN)                            FRATI 85
      GO TO 21                                                          FRATI 86
501   FORMAT (1H1, "OUTPUT OF FRATIO"/ 5(6X, 4HMCHN, 6X, 2HFR, 3X))     FRATI 87
502   FORMAT ( 5(7X, I2, 1PE12.4))                                      FRATI 88
503   FORMAT(///5(6X,4HMCHN,4X,5HBSUBK,2X,)//)                          FRATI 89
  513 FORMAT (44HOBOILING POINT IS NOT AVAILABLE FOR ELEMENT I3,        FRATI 90
     1  6H(MASS I3,1H))                                                 FRATI 91
      END                                                               FRATI 92
```

```
*DECK,BATMAN
      SUBROUTINE BATMAN
C     VERSION 1
C     R C TOMPKINS -- US ARMY NUCLEAR DEFENSE LABS
C     AUGUST 1966
C     REVISED BY P R JONES -- FEBRUARY 1969
C   THIS VERSION REPLACES SUBROUTINES INGEN, BATMAN, DECAY, AND DOSE OF
C   THE INITIAL VERSION OF DELFIC
C
C
C   THE FUNCTION OF THIS SUBROUTINE IS TO COMPUTE RADIOACTIVE DECAY
C   CHAINS BY MEANS OF THE BATEMAN EQUATION
CALLED BY FRATIO, GXPSR, AND MCHDEP
C
C  *  *  *  *  *  *  *  *  *  *  GLOSSARY  *  *  *  *  *  *  *  *  *  *  *  *
C   ABEGN(700)     INITIAL FISSION PRODUCT ABUNDANCES IN ATOMS/10000
C                  FISSIONS (PARALLEL TO NUCLID)
C   ABUNDO(700)    FISSION PRODUCT ABUNDANCES PER 10000 FISSIONS
C                  ATOMS AT TMSC IN FRATIO
C                  DISINTEGRATIONS/SEC AT TIME (JD=1)
C                  DISINTEGRATIONS FROM TENTER TO TEXIT
C                  OR INFINITY (JD=2)
C   B(15)          CONTRIBUTION OF ONE SUBCHAIN TO ABUNDO
C   CNIJ(680)      BATEMAN COEFFICIENTS FOR ONE SUBCHAIN
C   IBR            COUNTER TO KEEP PLACE IN BRANCHING RATIO TABLE WHILE
C                  SCANNING NUCLIDE TABLE
C   IFIGO          ASSIGNED GOTO PARAMETER CORRESPONDING TO IGO
C   IFJD           ASSIGNED GOTO PARAMETER CORRESPONDING TO JD
C   IGO            (LOGICAL) TRUE GIVES ACTIVITY,
C                  FALSE GIVES ATOMIC ABUNDANCES
C   INFORM(11)     TABLE OF DAUGHTER RETRIEVAL INFORMATION FOR EACH
C                  MEMBER OF A SUBCHAIN, OBTAINED BY TRUNCATING NUCLID
C                  FROM THE LEFT
C   JD             (LOGICAL) TRUE COMPUTES EXPOSURE RATE,
C                  FALSE COMPUTES DOSE
C   KDOS           (LOGICAL) TRUE COMPUTES DOSE FROM TENTER TO TEXIT,
C                  FALSE COMPUTES DOSE FROM TENTER TO INFINITY
C   KFJD           SEE IFJD
C   LIM(11)        SUBCHAIN TABLE OF INDICES FOR MULT TO FIND CURRENT
C                  BRANCHING PATH
C   LSUB           COUNTER FOR SUBCHAIN MEMBERS
C   NUC(11)        CROSS REFERENCE OF SUBCHAIN MEMBERS TO INDEX IN NUCLID
C   SBR(11)        SUBCHAIN BRANCHING RATIOS
C   SCA(15)        FISSION YIELDS OF SUBCHAIN MEMBERS
C   SDC(15)        DISINTEGRATION CONSTANTS OF SUBCHAIN MEMBERS
C   TENTER         ENTRY TIME (SEC) FOR DOSE CALCULATION WITH JD = FALSE
C   TEXIT          EXIT TIME (SEC) FOR DOSE CALCULATION
C                  WITH JD = FALSE, KDOS = TRUE
C   TIME           TIME (SEC) AT WHICH EXPOSURE RATE OF MASS CHAIN
C                  DEPOSIT IS CALCULATED WITH JD = TRUE
C
C
       COMMON /DECAY/ IGO,JD,KDOS,TENTER,TEXIT,TIME
       COMMON /FISHIN/ ABEGN(700),ABUNDO(700),BRANCH(130),CAPFIS,
     1  DCON(700),IBRA,INUC,MAXNUC,MULT(110),NUCLID(700)
       COMMON /UTILTY/  KOUT,NPRNT(15)
       LOGICAL IGO,JD,KDOS,NPRNT
       DIMENSION  EFAC   (11)   ,KBR    (11)
     1            ,INFORM(11)   ,LIM    (11)   ,NUC    (11)   ,SBR    (11)
     2            ,SCA    (11)   ,SDC    (11)
```

```
C
      LOGICAL FLAG
C
CC  SET INITIAL VALUES
      DO 1 I = 1,INUC
    1 ABUNDO(I) = 0.0
      IBR = 0
C
CC  BEGIN MAIN LOOP THROUGH THE NUCLIDE TABLE
C
   10 DO 500 IN = 1,INUC
C   FIND THE NEXT NUCLIDE THAT BEGINS A SUBCHAIN
      IF (NUCLID(IN))11,500,499
C
C   SET PARAMETERS FOR BEGINNING OF A SUBCHAIN
C          MEMBERSHIP COUNTER
   11 LSUB = 1
C          BRANCHING RATIO COUNTER
      LBR = IBR
      KBR(1) = LBR
C          STARTING INDEX
      NUC(1) = IN
   12 LIM(LSUB) = 4
C   PROCESS A SUBCHAIN MEMBER
   13 KP = NUC(LSUB)
      IM = LIM(LSUB)
      INFO = MOD(IABS(NUCLID(KP)),MULT(5))
      INFORM(LSUB) = INFO
      INC = 1
C   SET UP SUBCHAIN DISINTEGRATION CONSTANTS
      SDC(LSUB) = DCON(KP)
CHECK FOR END OF SUBCHAIN
      IF (INFO.EQ.4) GO TO 21
CHECK FOR BRANCHING
      IF (MOD(INFO,MULT(1)).LT.4) GO TO 14
      SBR(LSUB) = 1.0
      GO TO 15
C   SET UP SUBCHAIN BRANCHING RATIOS
   14 LB = LBR + 5 - IM
      SBR(LSUB) = BRANCH(LB)
C   EXTRACT THE DAUGHTER INCREMENT
   15 ID = MOD(INFO,MULT(IM+1))/MULT(IM)
C   SEE IF THIS INCREMENT SHOULD BE NEGATIVE
      IF (MOD(INFO,MULT(2))/MULT(1).EQ.IM)GO TO 16
C   SET PARAMETER TO LOOK AHEAD FOR BRANCHING RATIO OF DAUGHTER
      KI = KP
      GO TO 17
C   SET PARAMETER TO LOOK BEHIND FOR BRANCHING RATIO OF DAUGHTER
   16 KI = 1
      LBR = 0
      INC = -INC
COMPUTE DAUGHTER INDEX
   17 NDAUT = KP + INC*ID
      KDA = NDAUT - 1
C   STEP THROUGH THE NUCLIDE TABLE TO ESTABLISH THE CORRECT INDEX FOR
C   THE BRANCHING RATIO OF THE DAUGHTER
      DO  20 K = KI,KDA
   20 LBR = LBR + 4 - IABS(MOD(NUCLID(K),MULT(2)))
      KBR(LSUB+1) = LBR
C
```

```
C   ACCEPT THE DAUGHTER FOR MEMBERSHIP IN THE SUBCHAIN AND RECYCLE
       LSUB = LSUB + 1
       IF (LSUB.GT.11) GO TO 1301
       NUC(LSUB) = NDAUT
       GO TO 12
C
CC  A SUBCHAIN HAS NOW BEEN SET UP AND CAN BE STUDIED IN TOTO
C   ELIMINATE  UNI-MEMBERED SUBCHAIN
   21 IF (LSUB.EQ.1) GO TO 500
C   RUN BACK THROUGH THE SUBCHAIN TO ACCUMULATE BRANCHING RATIOS
       ASSIGN 23 TO LGO
       JL = 0
       SCA(LSUB) = 1.0
       LAST = LSUB + 1
       DO 22 L = 2,LSUB
       LBACK = LAST - L
       SCA(LBACK) = 1.0
       GO TO LGO, (22,23)
C   FIND THE LAST BRANCH IN THE SUBCHAIN
   23 IM = LIM(LBACK)
       IF (MOD(INFORM(LBACK),MULT(IM))/MULT(IM-1))22,22,24
   24 JL = LBACK
       ASSIGN 22 TO LGO
   22 SCA(LBACK) = SBR(LBACK)*SCA(LBACK+1)
       SCA(LSUB) = 0.0
CORRECT FISSION YIELDS FOR BRANCHING
       FLAG = .FALSE.
       DO 25 J = 1,LSUB
       JN = NUC(J)
       SCA(J) = SCA(J)*ABEGN(JN)
       IF (FLAG) GO TO 25
C   MAKE A NOTE IF AT LEAST ONE VALUE OF SCA IS NONTRIVIAL
       IF (SCA(J))25,25,27
   27 FLAG = .TRUE.
   25 CONTINUE
C
C   OMIT COMPUTATIONS FOR TRIVIAL SUBCHAIN
       IF (.NOT.FLAG) GO TO 30
C
CC  THE CENTRAL COMPUTATIONS BEGIN AT THIS POINT
C
       DO 200 N=1,LSUB
       IF(JD) TENTER=TIME
       EFAC(N)=EXP(-SDC(N)*TENTER)
       IF(KDOS) EFAC(N) = EFAC(N)-EXP(-SDC(N)*TEXIT)
       B=0.0
       DO 163 K1=1,N
       CNIJ=1.0
       Q=0.0
       DO 162 K=1,N
       K2=N-K+1
       IF(K2.NE.N) CNIJ=CNIJ*SDC(K2)
       IF(K2.EQ.K1) GO TO 162
       FACTC=SDC(K2)-SDC(K1)
       IF(ABS(FACTC).LT.1.E-15) FACTC=SIGN(1.E-15,FACTC)
       CNIJ=CNIJ/FACTC
  162 IF(K2.LE.K1)Q=Q+CNIJ*SCA(K2)
       IF(JD) GO TO 163
       IF(SDC(K1).LE.0.0) GO TO 163
       Q=Q/SDC(K1)
```

```
  163 B=B+Q*EFAC(K1)                                                        BATMA181
      IF(B.LE.0.0) GO TO 200                                                BATMA182
      IF(IGO) B=B*SDC(N)                                                    BATMA183
      NK=NUC(N)                                                             BATMA184
      ABUNDO(NK)=ABUNDO(NK)+B                                               BATMA185
  200 CONTINUE                                                              BATMA186
C                                                                           BATMA187
C   SET UP A NEW SUBCHAIN STARTING FROM DEEPEST UNEXPLORED BRANCH           BATMA188
   30 IF (JL)500,499,31                                                     BATMA189
   31 LSUB = JL                                                             BATMA190
      LIM(LSUB) = LIM(LSUB) - 1                                             BATMA191
      LBR = KBR(LSUB)                                                       BATMA192
      GO TO 13                                                              BATMA193
C                                                                           BATMA194
C                                                                           BATMA195
 1301         WRITE (KOUT,1351) NUCLID(IN)                                  BATMA196
C                                                                           BATMA197
C   STEP UP BRANCH COUNTER IN MAIN LOOP                                     BATMA198
  499 IBR = IBR + 4 - MOD(IABS(NUCLID(IN)),MULT(1))                         BATMA199
  500 CONTINUE                                                              BATMA200
      IF (NPRNT(9)) WRITE (KOUT,1000) (NUCLID(I),ABUNDO(I),I=1,INUC)        BATMA201
      RETURN                                                                BATMA202
 1000 FORMAT (17H1OUTPUT OF BATMAN//8X6HNUCLID11X6HABUNDO/                  BATMA203
     1     (5X012,5X1PE12.4))                                               BATMA204
 1351 FORMAT (25H0SUBCHAIN BEGINNING WITH O12,8H TOO BIG)                   BATMA205
      END                                                                   BATMA206
```

```
*DECK,GXPSR                                                                 GXPSR  1
      SUBROUTINE GXPSR                                                      GXPSR  2
C                                                                           GXPSR  3
C     CASSIDY - NRDL / TOMPKINS - NOL                                       GXPSR  4
C                                                                           GXPSR  5
C     NOVEMBER 1965                                                         GXPSR  6
CALLED BY PAM2                                                              GXPSR  7
      COMMON /DECAY/ IGO,JD,KDOS,TENTER,TEXIT,TIME                          GXPSR  8
      COMMON /FISHIN/ ABEGN(700),ABUNDO(700),BRANCH(130),CAPFIS,            GXPSR  9
     1  DCON(700),IBRA,INUC,MAXNUC,MULT(11),NUCLID(700)                     GXPSR 10
      COMMON /FRYLNG/ BSUBK(90),ERM(185),JRM(185),KRM,ECF(90)               GXPSR 11
      COMMON /OUTPUT/ FISNUM,FF(200),FW,ITAB,JGO,MASCHN,PSIZE(200),         GXPSR 12
     1 FMASS(200),PACT(200)                                                 GXPSR 13
      COMMON /UTILTY/  KOUT,NPRNT(15)                                       GXPSR 14
      LOGICAL IGO,JD,KDOS,NPRNT                                             GXPSR 15
C                                                                           GXPSR 16
      DIMENSION XRT(90)                                                     GXPSR 17
C                                                                           GXPSR 18
      DATA CROSS,UNIT/1.3E-4,1.0/                                           GXPSR 19
C                                                                           GXPSR 20
  901 FORMAT                                                                GXPSR 21
     1     (16H1OUTPUT OF GXPSR/5X13HPARTICLE SIZE7X24HFISSION PRODUCT ACGXPSR 22
     2TIVITY)                                                               GXPSR 23
  902 FORMAT                                                                GXPSR 24
     1     (8X7H METERS16X11H(R*M**2)/HR//)                                 GXPSR 25
  903 FORMAT                                                                GXPSR 26
     1     (5X1PE12.4,14XE12.4)                                             GXPSR 27
  912 FORMAT                                                                GXPSR 28
     1     (9X7H METERS1[illegible]**2//)                                   GXPSR 29
```

```
C
      CALL BATMAN
      MAXMCH = 90
      MCH = 0
      DO 1 I = 1,MAXMCH
    1 XRT(I) = 0.0
C
      DO 10 J = 1,KRM
      K = JRM(J)
      IF (ERM(J))11,10,12
   11 MCH = MCH + 1
COMPUTE MASS CHAIN NORMALIZATION FACTOR
C
   12 XRT(MCH) = XRT(MCH) + ABUNDO(K)*ABS(ERM(J))
C
   10 CONTINUE
C
      DO 20 LC = 1,MCH
      IF (XRT(LC))20,20,21
   21 BNEX = BSUBK(LC)
      CRISS = CROSS**BNEX
      RADIAL = ECF(LC)/(UNIT + CRISS*ECF(LC))
      STRAIT = RADIAL*CRISS
      TNEX = FISNUM*XRT(LC)
      DO 40 LD = 1,ITAB
   40 FP(LD) = FP(LD) + (RADIAL*PSIZE(LD)**BNEX + STRAIT)*TNEX*FMASS(LD)
   20 CONTINUE
C
C
      IF (.NOT.NPRNT(10)) RETURN
C
      WRITE (KOUT,901)
      IF (JO) GO TO 101
      WRITE (KOUT,912)
      GO TO 102
  101 WRITE (KOUT,902)
  102 CONTINUE
      DO 103 I=1,ITAB
      WRITE (KOUT,903) PSIZE(I),FP(I)
  103 CONTINUE
C
      RETURN
      END
```

```
*DECK,URAN
      SUBROUTINE URAN
C
C     R C TOMPKINS - US ARMY NUCLEAR DEFENSE LABS
C     MAY 1966
CALLED BY PAM2
C
C   DLAM          DISINTEGRATION CONSTANT OF NP239
C   PLAM          DISINTEGRATION CONSTANT OF U239
C
      COMMON /DECAY/ IGO,JD,KDOS,TENTER,TEXIT,TIME
      COMMON /FISHIN/ ABEGN(700),ABUNDO(700),BRANCH(130),CAPFIS,
     1 DCON(700),IBRA,INUC,MAXNUC,MULT(11),NUCLID(700)
      COMMON /OUTPUT/ FISNUM,FP(200),FW,ITAB,JGO,MASCHN,PSIZE(200),
     1 FMASS(200),PACT(200)
      COMMON /UTILTY/  KOUT,NPRNT(15)
      LOGICAL IGO,JD,KDOS,NPRNT
C
      PLAM = 0.693147/(23.5*60.0)
COMPUTE NP239 DISINTEGRATION CONSTANT
COMPUTE U239 DISINTEGRATION CONSTANT
      DLAM = 0.693147/(56.0*3600.0)
C
    2 AZERO = CAPFIS*1.E4*PLAM
      GLMP = DLAM/(DLAM - PLAM)
      GLUMP = AZERO*GLMP
C
      IF (.NOT.JD) GO TO 3
      ABURAN = AZERO*EXP (-PLAM*TIME)
      ABNEP = GLMP*ABURAN - GLUMP*EXP (-DLAM*TIME)
      GO TO 7
C
    3 IF (.NOT.KDOS) GO TO 4
      ABURAN = AZERO/PLAM*(EXP (-PLAM*TENTER) - EXP (-PLAM*TEXIT))
      ABNEP = GLMP*ABURAN -
     1GLUMP*(EXP (-DLAM*TENTER) - EXP (-DLAM*TEXIT))/DLAM
      GO TO 7
C
    4 ABURAN = AZERO/PLAM*EXP (-PLAM*TENTER)
C
      ABNEP = GLMP*ABURAN - GLUMP/DLAM*EXP (-DLAM*TENTER)
    7 ANEP = (ABURAN*.327E-6 + ABNEP*.966E-6)*FISNUM
      DO 8 J=1,ITAB
    8 FP(J) = FP(J) + ANEP*FMASS(J)
C
      IF (NPRNT(12)) WRITE (KOUT,100) ANEP
  100 FORMAT
     1    (23H1OUTPUT OF URAN/5X21HMASS 239 CONTRIBUTES 1PE12.4,
     2    23H TO EACH PARTICLE SIZE.)
      RETURN
      END
```

```
*DECK,INDCD2
      SUBROUTINE INDCD2
C
C     NOVEMBER 1966
      COMMON /DECAY/ IGO,JD,KDOS,TENTER,TEXIT,TIME
      COMMON/INDUS/ALBFOM,FAC(7,18),FOGRNY(7,18),ISO(18),LMAX,XLAM(7,18)
      COMMON /OUTPUT/ FISNUM,FP(200),FW,ITAB,JGO,MASCHN,PSIZE(200),
     1 FMASS(200),PACT(200)
      COMMON /UTILTY/  KOUT,NPRNT(15)
      LOGICAL IGO,JD,KDOS,NPRNT
C
 1000 FORMAT
     1    (17H1OUTPUT OF INDCD2/5X53HINDUCED ACTIVITY IN THE TRANSPORTED
     2 SOIL CONTRIBUTES 1PE12.4,23H TO EACH PARTICLE SIZE.)
C
      SDRE = 0.0
C
      DO 24 L = 1,LMAX
      IS = ISO(L)
C
      DO 22 I = 1,IS
      DLAM = -XLAM(I,L)
      IF (.NOT.JD) GO TO 12
      DRI = -FAC(I,L)*DLAM*FOGRNY(I,L)*EXP(DLAM*TIME)
      GO TO 22
C
   12 IF (.NOT.KDOS) GO TO 14
      DRI = FAC(I,L)*FOGRNY(I,L)*(EXP(DLAM*TENTER) - EXP(DLAM*TEXIT))
      GO TO 22
C
   14 DRI = FAC(I,L)*FOGRNY(I,L)*EXP(DLAM*TENTER)
C
   22 SDRE = SDRE + DRI
   24 CONTINUE
C
C
      SDRE = SDRE*ALBFOM*FISNUM
C
      DO 26 MA = 1,ITAB
   26 FP(MA) = FP(MA) + SDRE*FMASS(MA)
C
      IF (NPRNT(11)) WRITE (KOUT,1000) SDRE
      RETURN
      END
```

```
*DECK,MCHDEP
      SUBROUTINE MCHDEP
C
C         R C TOMPKINS - US ARMY NUCLEAR DEFENSE LABS
C       NOVEMBER 1966
CALLED BY PAM2
C
      COMMON /DECAY/ IGO,JD,KDOS,TENTER,TEXIT,TIME
      COMMON /FISHIN/ ABEGN(700),ABUNDC(700),BRANCH(130),CAPFIS,
     1  DCON(700),IBRA,INUC,MAXNUC,MULT(11),NUCLID(700)
      COMMON /FRYLNG/ BSUBK(90),ERM(185),JRM(185),KRM,ECF(90)
      COMMON /OUTPUT/ FISNUM,FF(200),FW,ITAB,JGO,MASCHN,PSIZE(200),
     1 FMASS(200),PACT(200)
      COMMON /UTILTY/  KOUT,NPRNT(15)
      LOGICAL IGO,JD,KDOS,NPRNT
C
      DIMENSION FMTA( 7),FMTB(10)
C
      LOGICAL TZERO,TMINUS
C
      DATA (FMTA(I),I=1,6) /10H(/14X31H T, 10HOTAL ABUND, 10HANCE OF MA,
     1 10HSS CHAIN I, 10H3,4H WAS 1, 10HPE12.5,9H /,
     2 (FMTB(I),I=1,9)/10H(17H1OUTPU, 10HT OF MCHDE, 10HP///5X13HP,
     3 10HARTICLE SI, 10HZE6X22HACT, 10HIVITY OF M, 10HASS CHAINI,
     4 10H4/9X6HMETE, 10HRS18X, 9H /,
     5 UNITC/ 10HCURIES   /)/, UNITF/ 10HFISSIONS/)/
      DATA CROSS,UNIT/1.0E-4,1.0/
C
  903 FORMAT
     1     (5X1PE12.4,14XE12.4)
C
      TZERO = .FALSE.
      TMINUS = .FALSE.
      FMTA( 7) = UNITC
      FMTB(10) = UNITC
      IF (TIME)11,1,2
    1 TZERO = .TRUE.
COMPUTE EQUIVALENT FISSIONS
      ABNDM = 1.0
      FISNUM = FISNUM*1.E4
      FMTA( 7) = UNITF
      FMTB(10) = UNITF
    2 IF (NPRNT(13)) WRITE (KOUT,FMTB) MASCHN
      IF (TZERO) GO TO 10
COMPUTE ACTIVITY IN CURIES
      CALL BATMAN
      ABNDM = 0.0
      DO 220 K1=1,INUC
      IF(MASCHN.NE.IABS(NUCLID(K1))/MULT(9)) GO TO 220
C     SUM THE ACTIVITIES IN ONE MASS CHAIN AND CONVERT TO CURIES
      ABNDM = ABNDM + ABUNDC(K1)
  220 CONTINUE
      ABNDM = ABNDM/3.7E10
C
      IF (ABNDM)9,9,10
C     THE REST IS AN ABRIDGEMENT OF GXFSR
   10 BNEX = BSUBK(MASCHN-71)
      CRISS = CROSS**BNEX
      RADIAL = ECF(MASCHN-71)/(UNIT + CRISS*ECF(MASCHN-71))
      STRAIT = RADIAL*CRISS
```

```
      ABNDM = ABNOM*FISNUM
      DO 134 LD = 1,ITAB
      DSR = (RADIAL*PSIZE(LD)**BNEX + STRAIT)*ABNDM*FMASS(LD)
  134 FP(LD) =  FP(LD) + DSR
      IF (.NOT.NPRNT(13)) GO TO 9
      WRITE (KOUT,903)
     1     (PSIZE(I),FP(I),I=1,ITAB)
    9 WRITE (KOUT,FMTA) MASCHN,ABNDM
      RETURN
C  * *  * *  *  *  *  CODE INSERTION POINT  *  *  *  *  *  *  *  *  *
C
   11 TMINUS = .TRUE.
      RETURN
C
C  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
      END
```

APPENDIX A

STRUCTURE AND SPECIFICATION OF THE HORIZONTAL RESOLUTION NET FOR HORIZONTALLY NONHOMOGENEOUS WIND AND TURBULENCE FIELDS

All wind and turbulence fields are resolved in the vertical in terms of strata in each of which unique data are specified. In most cases the fields are taken to be horizontally homogeneous,* but occasionally a situation occurs where it is important to account for variation with geographical location, particularly with regard to the winds. Then it is necessary to spatially resolve the wind field in the horizontal. In DELFIC this horizontal resolution is identical in each vertical stratum so that the remainder of this discussion involves only the two horizontal dimensions.

A rectangular "control" net, oriented with its axes in the west-to-east and south-to-north directions, x and y respectively, with square mesh of spacing WINT, its southwest corner at point (XLLC,YLLC), and with numbers ICX and JCX of mesh units in the x and y directions respectively is specified by the user (DTM cards 3 and 4). Figure A.1 illustrates a case with ICX = 5 and JCX = 3.

Each one of the control net mesh units may be quartered, and each quarter may be quartered, etc. Information as to whether or not quartering occurs is contained in an array NET(ICX,JCX): if a mesh is not quartered, a positive integer, which serves as an index to the data arrays, is contained in the appropriate NET entry, but if the mesh is quartered, NET contains a negative integer which when set positive is the index to another array NETSU(NCX). For each quartered control mesh or submesh, NETSU contains

---

*A horizontally homogeneous field is one in which the field property may vary with horizontal direction (e.g., a vector field such as a wind field) but which is constant along any directional axis.

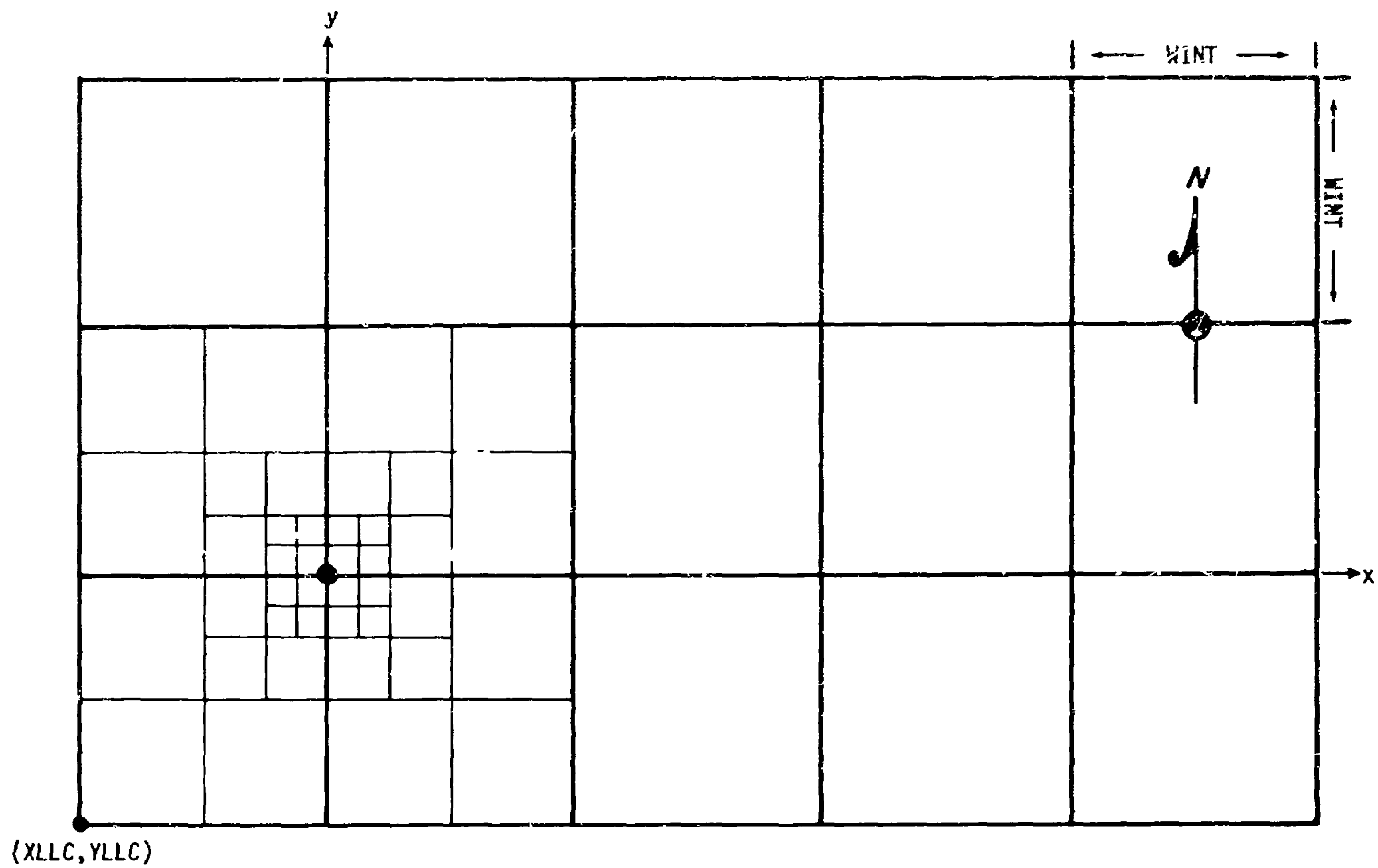

Figure A.1. Illustration of a horizontal transport space net with ICX = 5, JCX = 3 and three levels of mesh quartering.

four successive entries, each of which contains a positive or negative integer. A positive integer indicates that the mesh quarter is not further quartered and the integer serves as an index to the data arrays. A negative integer indicates that the quarter is itself quartered, and when set positive the integer serves as an index to the first of another set of four entries in NETSU, and so on.

Mesh quartering specifications are via DTM cards 5r which are read into array MARY(MARX). Having already received ICX and JCX for the control net, the code reads MARY(1) to MARY(MARX) where MARX = ICX*JCX. Each entry is for a different control net mesh, and if 0 it specifies quartering, but if 1 it specifies no quartering. As many cards are read as necessary to accommodate the MARX entries. Next, the code reads MARY(1) to MARY(MARK) where MARK = 4* (number of zeros found on the preceding MARY cards). These define the first subdivision level of mesh quarters, and as many cards are read as necessary to accommodate the MARK entries. This process is repeated for as many additional levels of subdivision as necessary.

Ordering of entries on the MARY cards is as follows. For the control net the first MARY entry is for the southwest corner mesh, we then proceed eastward along the bottom row to the right boundary, then to the left-most mesh in the row above, etc. The MARY cards for the quartered meshes are filled by considering the quartered meshes in the same sequence as their zeros are found on the preceding MARY cards which define them. Then for each set of quarters the entries are in the sequence

2	3
1	4

Figure A.2 gives the MARY cards required by the Fig. A.1 example. The control mesh entries are contained on card a, the first level of quartering on card b, the second on card c and the third on card d.

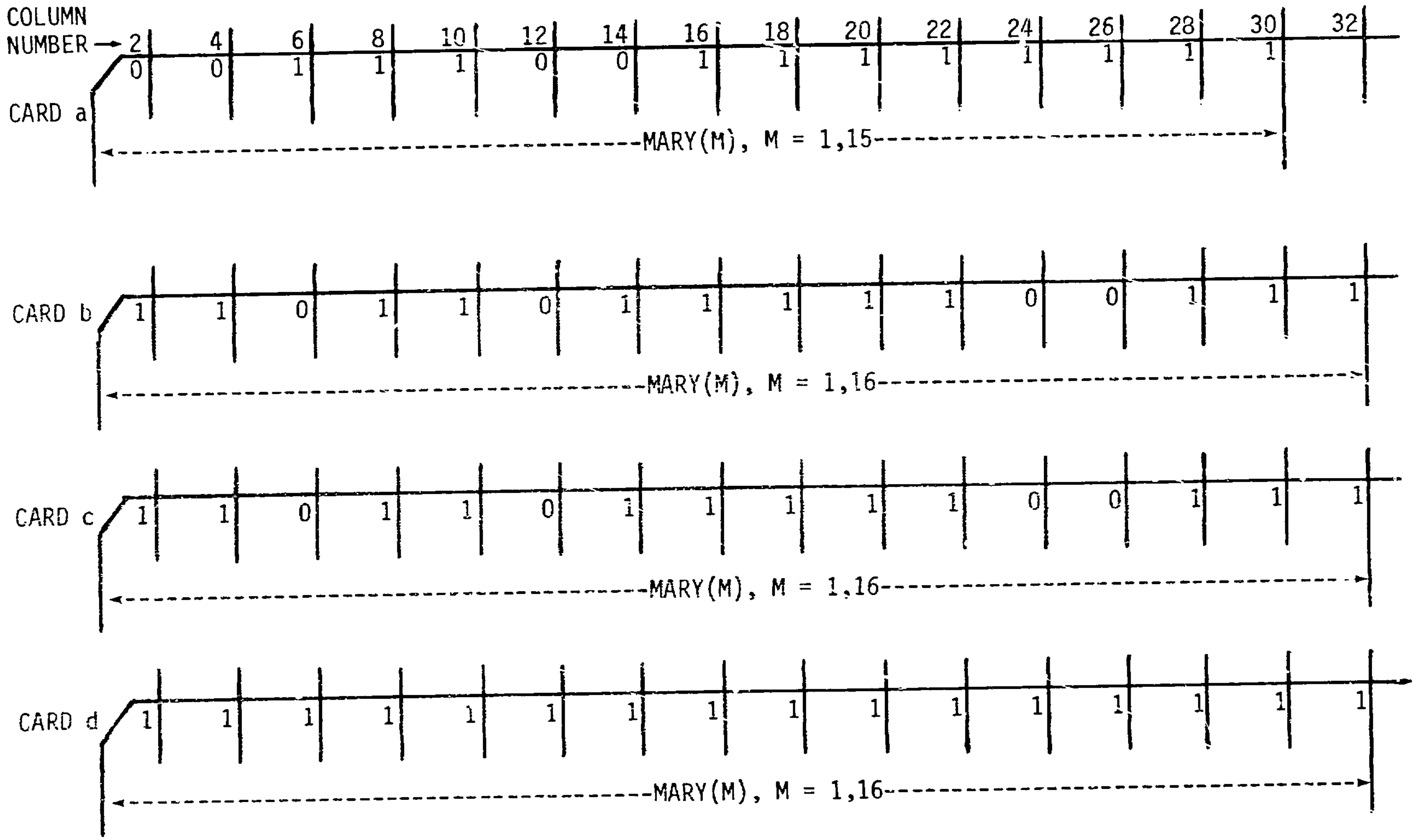

Figure A.2. MARY cards required to define the net structure of Fig. A.1.

APPENDIX B

MAP ORDINATE THRESHOLDS

Two map ordinate threshold values are either specified by the user (QCUT and CUTMAP, sec. 2.4 and sec. 3.3, card 6) or set by the program. Here we describe how the program sets these values. The parameter QCUT, designated ω_{min} in Vol. I sec. 5.2, is the minimum acceptable contribution from an individual deposit increment of fallout at any point in the map; that is, any contribution at any point less than QCUT is ignored. CUTMAP is the minimum acceptable cumulative value of contributions at any map point; that is, after accumulation of all contributions, any map ordinate with value less than CUTMAP is set to zero.

On the basis of experience we find that for H + 1 hour normalized exposure rate maps QCUT = 10^{-4} and CUTMAP = 10^{-2} work satisfactorily in most cases. These quantities are designated QCUTA and CUTMPA in the program (line 30 in subroutine OPM2). The QCUTA value assumes that the number of deposit increments of fallout is approximately in the range 500 to 2500, and it forms the basis of all QCUT evaluations; thus, if many fewer than 500 or many more than 2500 deposit increments of fallout are used, some experimentation with QCUTA values should be undertaken.

For exposure rates at times other than H + 1 hour and for integrated exposure (i.e., dose) QCUT = QCUTA* Φ where Φ is as for eq. (4.3.1) of Vol. I, and similarly for CUTMAP.

For activity from an individual mass chain (NREQ = 14, Table 3), QCUT = QCUTA* 2.08 x 10^{13} in units of equivalent fissions, and QCUT = QCUTA* 10^{-4} in units Curies m^{-2}, and similarly for CUTMAP.

For maps which use deposited fallout mass instead of activity (NREQ < 2 and NREQ > 10, Table 3) QCUT = QCUTA* $m_s/(7 \times 10^9 GW_F)$ where m_s

is total mass of debris and soil lofted by the cloud, G is a combined grounded roughness-survey instrument response correction factor (GRUFF), and 7×10^9 is a rough average activity K factor ((Roentgen -m^2)/(hr - KT)). CUTMAP is computed similarly.

APPENDIX C

FISSION YIELD DATA CARDS

(See sec. 3.4)

P239FI

					ABEGN	1
0.	0.	0.	0.	0.	ABEGN	2
0.	0.	0.	0.	0.	ABEGN	3
0.	0.	0.	0.	0.	ABEGN	4
0.	0.	0.	0.	0.	ABEGN	5
0.	0.	0.	0.	0.	ABEGN	6
0.	0.	.600000E-03	.466000E-01	.160000E+00	ABEGN	7
.141000E+00	.310000E-01	0.	0.	0.	ABEGN	8
.105000E+00	.594000E+00	.828000E+00	.149800E+00	.749000E-01	ABEGN	9
.253333E-02	0.	0.	.304000E-01	.680000E+00	ABEGN	10
.165000E+01	.104000E+01	.782000E-01	.391000E-01	0.	ABEGN	11
0.	.647000E+00	.258000E+01	.258000E+01	.647000E+00	ABEGN	12
0.	0.	0.	0.	.397000E+00	ABEGN	13
.297000E+01	.506000E+01	.223000E+01	.133000E+00	0.	ABEGN	14
.709000E-01	.279000E+01	.778600E+01	.559000E+01	.500000E+00	ABEGN	15
.250000E+00	0.	0.	.167000E+01	.871000E+01	ABEGN	16
.113000E+02	.377000E+01	.719000E-01	0.	0.	ABEGN	17
.317000E+00	.708000E+01	.172000E+02	.405660E+01	.345365E+01	ABEGN	18
.533333E+00	0.	0.	0.	.454000E+01	ABEGN	19
.196000E+02	.212000E+02	.562000E+01	0.	0.	ABEGN	20
.170000E+01	.164700E+02	.326600E+02	.164700E+02	.862900E+00	ABEGN	21
.862900E+00	0.	.246000E+01	.129400E+02	.387200E+02	ABEGN	22
.299200E+02	.572000E+01	0.	0.	0.	ABEGN	23
0.	.513000E+01	.383000E+02	.391000E+02	.143500E+02	ABEGN	24
.860000E+00	0.	0.	.840000E+00	.249000E+02	ABEGN	25
.647000E+02	.217000E+02	.356000E+01	0.	0.	ABEGN	26
.153000E+02	.659000E+02	.355000E+02	.940000E+01	0.	ABEGN	27
0.	0.	0.	.684000E+01	.563000E+02	ABEGN	28
.104000E+03	.492000E+02	.391000E+01	0.	0.	ABEGN	29
.655000E+00	.344000E+02	.103000E+03	.879143E+02	.152000E+02	ABEGN	30
0.	0.	0.	0.	.186000E+02	ABEGN	31
.971000E+02	.126000E+03	.419000E+02	.799000E+00	0.	ABEGN	32
0.	.404000E+01	.678000E+02	.153500E+03	.903000E+02	ABEGN	33
.120000E+02	0.	0.	0.	0.	ABEGN	34
.374000E+02	.150000E+03	.150000E+03	.374000E+02	0.	ABEGN	35
0.	.185000E+02	.124000E+03	.197000E+03	.615000E+02	ABEGN	36
.364000E+01	0.	0.	0.	0.	ABEGN	37
.196000E+01	.764000E+02	.215000E+03	.154000E+03	.272000E+02	ABEGN	38
0.	0.	0.	.383000E+02	.186000E+03	ABEGN	39
.225000E+03	.697000E+02	.505100E+00	.252550E+00	0.	ABEGN	40
0.	.337000E+01	.100000E+03	.260000E+03	.174000E+03	ABEGN	41
.145171E+02	.145171E+02	0.	0.	.344000E+02	ABEGN	42
.195000E+03	.272000E+03	.966000E+02	.247000E+01	0.	ABEGN	43
0.	0.	.190000E+01	.998000E+02	.299000E+03	ABEGN	44
.231000E+03	.441000E+02	0.	0.	0.	ABEGN	45
.245000E+02	.182900E+03	.311600E+03	.137400E+03	.817000E+01	ABEGN	46
0.	.987000E+00	.271000E+01	.105000E+03	.296000E+03	ABEGN	47
.213000E+03	.190346E+02	.190346E+02	0.	0.	ABEGN	48
.627000E+02	.250000E+03	.250000E+03	.627000E+02	0.	ABEGN	49
0.	0.	0.	.142000E+02	.138000E+03	ABEGN	50
.273000E+03	.138000E+03	.142000E+02	0.	0.	ABEGN	51
0.	0.	.636000E+01	.107000E+03	.242000E+03	ABEGN	52
.142000E+03	.191000E+02	0.	0.	0.	ABEGN	53
0.	.272000E+01	.807000E+02	.210000E+03	.141000E+03	ABEGN	54
.231000E+02	0.	0.	0.	.109000E+01	ABEGN	55
.573000E+02	.172000E+03	.133000E+03	.254000E+02	0.	ABEGN	56
0.	0.	0.	0.	.201000E+02	ABEGN	57
.105000E+03	.136000E+03	.454000E+02	.864000E+00	0.	ABEGN	58
0.	.246000E+01	.413000E+02	.938000E+02	.551000E+02	ABEGN	59
.373590E+01	.186795E+01	0.	0.	0.	ABEGN	60

0.	0.	.751000E+01	.300000E+02	.300000E+02	ABEGN	61
.751000E+01	0.	0.	.118000E+01	.879000E+01	ABEGN	62
.150000E+02	.663000E+01	.200500E+00	.100250E+00	0.	ABEGN	63
0.	0.	.393000E-01	.207000E+01	.620000E+01	ABEGN	64
.478000E+01	.913000E+00	0.	0.	0.	ABEGN	65
.744000E+00	.361000E+01	.437000E+01	.135000E+01	.980000E-02	ABEGN	66
.980000E-02	0.	0.	.142000E+00	.179000E+01	ABEGN	67
.377000E+01	.205000E+01	.249000E+00	0.	0.	ABEGN	68
.738000E+00	.278000E+01	.258000E+01	.303100E+00	.151550E+00	ABEGN	69
0.	0.	0.	0.	0.	ABEGN	70
0.	.282000E+00	.190000E+01	.301000E+01	.125010E+01	ABEGN	71
.557000E-01	0.	.258000E-01	.101000E+01	.284000E+01	ABEGN	72
.204000E+01	.182800E+00	.914000E-01	0.	0.	ABEGN	73
0.	0.	0.	.461000E+00	.224000E+01	ABEGN	74
.272000E+01	.840000E+00	.610000E-02	.610000E-02	0.	ABEGN	75
0.	.111000E+00	.141000E+01	.296000E+01	.812200E+00	ABEGN	76
.812200E+00	.495000E-01	.495000E-01	0.	0.	ABEGN	77
0.	.694000E+00	.262000E+01	.242000E+01	.562000E+00	ABEGN	78
0.	0.	.279000E+00	.188000E+01	.298000E+01	ABEGN	79
.624400E+00	.624400E+00	.315000E-01	.157500E-01	0.	ABEGN	80
.120000E-02	.901000E+00	.290000E+01	.240000E+01	.493000E+00	ABEGN	81
0.	0.	0.	0.	.580000E+00	ABEGN	82
.286000E+01	.175630E+01	.175630E+01	.543100E+00	.271550E+00	ABEGN	83
.153000E-01	0.	.175000E-01	.221000E+01	.465000E+01	ABEGN	84
.252000E+01	.103900E+00	.103900E+00	.103900E+00	0.	ABEGN	85
0.	.154000E+00	.581000E+01	.273590E+01	.273590E+01	ABEGN	86
.625000E+00	0.	0.	0.	.914000E+00	ABEGN	87
.558000E+01	.830000E+01	.162430E+01	.162430E+01	.108000E+00	ABEGN	88
0.	.205000E+00	.610000E+01	0.	.158000E+02	ABEGN	89
.530000E+01	.441600E+00	.220800E+00	0.	.216000E+00	ABEGN	90
.202000E+02	.697000E+02	.311660E+02	.311660E+02	.134000E+02	ABEGN	91
0.	0.	0.	.262000E+02	.113300E+03	ABEGN	92
.122000E+03	.164459E+02	.822295E+01	0.	0.	ABEGN	93
0.	0.	.248000E+02	.130000E+03	0.	ABEGN	94
.168000E+03	.562000E+02	.107000E+01	0.	0.	ABEGN	95
.166000E+02	.124000E+03	.211000E+03	.472058E+02	.236029E+02	ABEGN	96
.184333E+01	0.	0.	0.	.211000E+01	ABEGN	97
.824000E+02	.232000E+03	.166000E+03	.294000E+02	0.	ABEGN	98
0.	.415000E+02	.202000E+03	.124359E+03	.621796E+02	ABEGN	99
.252333E+02	.182733E+00	.913667E-01	0.	0.	ABEGN	100
.252000E+01	.987000E+02	.277000E+03	.199000E+03	.352000E+02	ABEGN	101
0.	0.	0.	0.	.280000E+02	ABEGN	102
.189000E+03	.300000E+03	.629410E+02	.314705E+02	.277000E+01	ABEGN	103
0.	.882000E+00	.828000E+02	.285000E+03	.251000E+03	ABEGN	104
.550000E+02	0.	0.	.343000E+02	.209000E+03	ABEGN	105
.156000E+03	.600000E+02	.102790E+01	.205580E+01	0.	ABEGN	106
.357000E+01	.106000E+03	.138000E+03	.925000E+02	.303000E+02	ABEGN	107
0.	0.	0.	.494000E+02	.214000E+03	ABEGN	108
.231000E+03	.611000E+02	0.	0.	.155000E+02	ABEGN	109
.128000E+03	.236000E+03	.112000E+03	.888000E+01	0.	ABEGN	110
.850000E+00	.594000E+02	.192000E+03	.159000E+03	.326000E+02	ABEGN	111
0.	0.	0.	.261000E+02	.137000E+03	ABEGN	112
.177000E+03	.591000E+02	.113000E+01	0.	.437000E+01	ABEGN	113
.736000E+02	.167000E+03	.980000E+02	.131000E+02	0.	ABEGN	114
0.	0.	.317000E+02	.126000E+03	.126000E+03	ABEGN	115
.317000E+02	0.	0.	0.	.119000E+02	ABEGN	116
.801000E+02	.127000E+03	.525000E+02	.235000E+01	0.	ABEGN	117
0.	.985000E+00	.385000E+02	.108000E+03	.776000E+02	ABEGN	118
.137000E+02	0.	0.	.159000E+01	.774000E+02	ABEGN	119
.936000E+02	.289000E+02	.414000E+00	0.	0.	ABEGN	120

0.	.414560E+01	.401390E+02	.796505E+02	.401390E+02	ABEGN	121
.414560E+01	0.	0.	0.	.151869E+02	ABEGN	122
.572700E+02	.531605E+02	.122883E+02	0.	0.	ABEGN	123
0.	.555300E+01	.338450E+02	.505580E+02	.194370E+02	ABEGN	124
.655000E+00	0.	.166000E+00	.117000E+02	.377000E+02	ABEGN	125
.311000E+02	.640000E+01	0.	0.	0.	ABEGN	126
.333000E+01	.207000E+02	.308000E+02	.118000E+02	.399000E+00	ABEGN	127
0.	0.	0.	0.	.190000E+00	ABEGN	128
.845000E+01	.217000E+02	.155000E+02	.275000E+01	0.	ABEGN	129
0.	.258000E+01	.126000E+02	.152000E+02	.470000E+01	ABEGN	130
.671000E-01	0.	0.	.608000E+00	.587000E+01	ABEGN	131
.116000E+02	.587000E+01	.608000E+00	0.	.226000E-01	ABEGN	132
.213000E+01	.731000E+01	.644000E+01	.141000E+01	0.	ABEGN	133
0.	.648000E+00	.367000E+01	.511000E+01	.182000E+01	ABEGN	134
.466000E-01	0.	.874000E-01	.147000E+01	.333000E+01	ABEGN	135
.195000E+01	.261000E+00	0.	.454000E+00	.181000E+01	ABECN	136
.281000E+01	.454000E+00	0.	0.	.111000E+00	ABEGN	137
.747000E+00	.118000E+01	.490000E+00	.219000E-01	0.	ABEGN	138
0.	.560000E-02	.225000E+00	.634000E+00	.454000E+00	ABEGN	139
.803000E-01	0.	0.	0.	0.	ABEGN	140
P239HE					ABEGN	141
0.	0.	0.	0.	0.	ABEGN	142
0.	0.	0.	0.	0.	ABEGN	143
0.	0.	0.	0.	0.	ABEGN	144
0.	0.	0.	0.	0.	ABEGN	145
0.	0.	0.	0.	0.	ABEGN	146
0.	0.	0.	0.	0.	ABEGN	147
0.	0.	0.	0.	0.	ABEGN	148
0.	0.	0.	0.	0.	ABEGN	149
0.	0.	0.	0.	0.	ABEGN	150
0.	0.	0.	0.	0.	ABEGN	151
0.	0.	0.	0.	0.	ABEGN	152
0.	0.	0.	0.	.620000E+00	ABEGN	153
.184000E+01	.478000E+01	.321000E+01	.525000E+00	0.	ABEGN	154
0.	.129000E+01	.592000E+01	.672000E+01	.996200E+00	ABEGN	155
.498100E+00	.207000E-01	0.	.549000E+00	.531000E+01	ABEGN	156
.106000E+02	.531000E+01	.549000E+00	0.	0.	ABEGN	157
0.	.350000E+01	.132000E+02	.458830E+01	.390630E+01	ABEGN	158
.943333E+00	0.	0.	0.	.166000E+00	ABEGN	159
.126000E+02	.214000E+02	.944000E+01	.562000E+00	0.	ABEGN	160
.119000E-01	.862000E+01	.279000E+02	.230000E+02	.306470E+01	ABEGN	161
.306470E+01	0.	0.	.594000E+01	.311000E+02	ABEGN	162
.402000E+02	.134000E+02	.130100E+00	.130100E+00	0.	ABEGN	163
0.	.158000E+01	.267000E+02	.605000E+02	.177500E+02	ABEGN	164
.237500E+01	0.	0.	0.	.168000E+02	ABEGN	165
.672000E+02	.336000E+02	.840000E+01	0.	0.	ABEGN	166
.766000E+01	.573000E+02	.487500E+02	.215000E+02	.128000E+01	ABEGN	167
0.	0.	0.	.106000E+01	.415000E+02	ABEGN	168
.116000E+03	.836000E+02	.148000E+02	0.	0.	ABEGN	169
0.	.225000E+02	.109000E+03	.135190E+03	.411000E+02	ABEGN	170
.298400E+00	.149200E+00	0.	0.	.641000E+01	ABEGN	171
.806000E+02	.170000E+03	.922000E+02	.112000E+02	0.	ABEGN	172
0.	.565000E+00	.512000E+02	.177000E+03	.155000E+03	ABEGN	173
.339000E+02	0.	0.	0.	0.	ABEGN	174
.235000E+02	.143000E+03	.213000E+03	.822000E+02	.277000E+01	ABEGN	175
0.	.295000E+01	.874000E+02	.227000E+03	.152000E+03	ABEGN	176
.250000E+02	0.	0.	0.	0.	ABEGN	177
.434000E+02	.199000E+03	226000E+03	.655000E+02	.698000E+00	ABEGN	178
0.	0.	0.	0.	.170000E+02	ABEGN	179
.141000E+03	.259000E+03	.625127E+02	.312564E+02	.973000E+01	ABEGN	180

0.	0.	.548000E+02	.219000E+03	.219000E+03	ABEGN	181
.278512E+02	.278512E+02	0.	0.	.675000E+01	ABEGN	182
.114000E+03	.257000E+03	.151000E+03	.202000E+02	0.	ABEGN	183
0.	0.	0.	.400000E+02	.194000E+03	ABEGN	184
.236000E+03	.729000E+02	.105000E+01	0.	0.	ABEGN	185
.312000E+01	.926000E+02	.241000E+03	.161000E+03	.265000E+02	ABEGN	186
0.	0.	0.	.454000E+02	.196000E+03	ABEGN	187
.211000E+03	.285119E+02	.285119E+02	0.	0.	ABEGN	188
.206000E+02	.139000E+03	.220000E+03	.909000E+02	.407000E+01	ABEGN	189
0.	0.	0.	.122000E+01	.644000E+02	ABEGN	190
.192000E+03	.149000E+03	.285000E+02	0.	0.	ABEGN	191
0.	0.	.517000E+00	.485000E+02	.167000E+03	ABEGN	192
.147000E+03	.322000E+02	0.	0.	0.	ABEGN	193
0.	0.	.348000E+02	.138000E+03	.138000E+03	ABEGN	194
.348000E+02	0.	0.	0.	0.	ABEGN	195
.236000E+02	.108000E+03	.122000E+03	.356000E+02	0.	ABEGN	196
0.	0.	0.	0.	.379000E+01	ABEGN	197
.478000E+02	.101000E+03	.546000E+02	.664000E+01	0.	ABEGN	198
0.	.206000E+00	.193000E+02	.663000E+02	.584000E+02	ABEGN	199
.650540E+01	.325270E+01	0.	0.	0.	ABEGN	200
0.	0.	.812000E+01	.427000E+02	.639000E+02	ABEGN	201
.245000E+02	.826000E+00	0.	.750000E+00	.223000E+02	ABEGN	202
.578000E+02	.388000E+02	.323240E+01	.161620E+01	0.	ABEGN	203
0.	0.	0.	.969000E+01	.443000E+02	ABEGN	204
.502000E+02	.146000E+02	.155000E+00	0.	0.	ABEGN	205
.280000E+01	.270000E+02	.481000E+02	.270000E+02	.142310E+01	ABEGN	206
.142310E+01	0.	0.	.152000E+00	.133000E+02	ABEGN	207
.456000E+02	.402000E+02	.880000E+01	0.	0.	ABEGN	208
.530000E+01	.323000E+02	.482000E+02	.945320E+01	.472660E+01	ABEGN	209
.105900E+[illegible]	.105900E+[illegible]	0.	0.	0.	ABEGN	210
0.	.620000E+00	.184000E+02	.478000E+02	.320000E+02	ABEGN	211
.525000E+01	0.	0.	.918000E+01	.397000E+02	ABEGN	212
.428000E+02	.574310E+01	.287155E+01	0.	0.	ABEGN	213
0.	0.	0.	.314000E+01	.258000E+02	ABEGN	214
.476000E+02	.226000E+02	.914800E+00	.914800E+00	0.	ABEGN	215
0.	.190000E+00	.133000E+02	.429000E+02	.179915E+02	ABEGN	216
.179915E+02	.210410E+01	.210410E+01	0.	0.	ABEGN	217
0.	.579000E+01	.328000E+02	.458000E+02	.163000E+02	ABEGN	218
0.	0.	.876000E+00	.195000E+02	.473000E+02	ABEGN	219
.151454E+02	.151454E+02	.224640E+01	.112320E+01	0.	ABEGN	220
0.	.772000E+01	.375000E+02	.454000E+02	.141000E+02	ABEGN	221
.102200E+00	.102200E+00	0.	0.	.340000E+01	ABEGN	222
.279000E+02	.261232E+02	.261232E+02	.124009E+02	.620045E+01	ABEGN	223
.194000E+01	0.	.222000E+00	.155000E+02	.502000E+02	ABEGN	224
.414000E+02	.289020E+01	.289020E+01	.289020E+01	0.	ABEGN	225
0.	.700000E+00	.413000E+02	.291726E+02	.291726E+02	ABEGN	226
.102000E+02	.297350E+00	.594700E+00	0.	.109000E+01	ABEGN	227
.246000E+02	.594000E+02	.190588E+02	.190588E+02	.555000E+01	ABEGN	228
0.	0.	.142000E+02	0.	.616000E+02	ABEGN	229
.332500E+02	.447245E+01	.223623E+01	0.	0.	ABEGN	230
.129000E+02	.673000E+02	.442672E+02	.442672E+02	.291000E+02	ABEGN	231
.555000E+0[illegible]	0.	0.	.105000E+02	.707000E+02	ABEGN	232
.112000E+03	.235312E+02	.117656E+02	.690000E+00	0.	ABEGN	233
0.	0.	.109000E+02	.609000E+02	0.	ABEGN	234
.138000E+03	.608000E+02	.362000E+01	0.	0.	ABEGN	235
.207000E+01	.613000E+02	.160000E+03	.543810E+02	.271905E+02	ABEGN	236
.586667E+01	0.	0.	0.	0.	ABEGN	237
.329000E+02	.151000E+03	.171000E+03	.496000E+02	.529000E+00	ABEGN	238
0.	.148000E+02	.122000E+03	.114353E+03	.571763E+02	ABEGN	239
.353333E+02	.143153E+01	.715767E+00	0.	0.	ABEGN	240

0.	.474000E+02	.205000E+03	.221000E+03	.586000E+02	ABEGN 241
0.	0.	0.	0.	.479000E+01	ABEGN 242
.107000E+03	.259000E+03	.828421E+02	.414211E+02	.121000E+02	ABEGN 243
0.	0.	.315000E+02	.178000E+03	.249000E+03	ABEGN 244
.882000E+02	.227000E+01	0.	.669000E+01	.113000E+03	ABEGN 245
.127500E+03	.750000E+02	.508235E+01	.101647E+02	0.	ABEGN 246
0.	.525000E+02	.103500E+03	.103500E+03	.525000E+02	ABEGN 247
0.	0.	0.	.181000E+02	.136000E+03	ABEGN 248
.232000E+03	.102000E+03	.602000E+01	0.	.198000E+01	ABEGN 249
.774000E+02	.217000E+03	.157000E+03	.276000E+02	0.	ABEGN 250
0.	.328000E+02	.159000E+03	.193000E+03	.598000E+02	ABEGN 251
.853000E+00	0.	0.	.748000E+01	.941000E+02	ABEGN 252
.198000E+03	.107000E+03	.131000E+02	0.	.514000E+00	ABEGN 253
.482000E+02	.166000E+03	.146000E+03	.321000E+02	0.	ABEGN 254
0.	0.	.186000E+02	.113000E+03	.170000E+03	ABEGN 255
.651000E+02	.220000E+01	0.	0.	.189000E+01	ABEGN 256
.553000E+02	.144000E+03	.963000E+02	.158000E+02	0.	ABEGN 257
0.	0.	.238000E+02	.103000E+03	.109000E+03	ABEGN 258
.294000E+02	0.	0.	.681000E+01	.560000E+02	ABEGN 259
.103000E+03	.490000E+02	.389000E+01	0.	0.	ABEGN 260
0.	.339000E+00	.238000E+02	.767000E+02	.632000E+02	ABEGN 261
.130000E+02	0.	0.	0.	.662000E+01	ABEGN 262
.403000E+02	.602000E+02	.232000E+02	.780000E+00	0.	ABEGN 263
0.	.386000E+00	.151000E+02	.424000E+02	.304000E+02	ABEGN 264
.537000E+01	0.	0.	0.	0.	ABEGN 265
0.	0.	0.	0.	0.	ABEGN 266
0.	0.	0.	0.	0.	ABEGN 267
0.	0.	0.	0.	0.	ABEGN 268
0.	0.	0.	0.	0.	ABEGN 269
0.	0.	0.	0.	0.	ABEGN 270
0.	0.	0.	0.	0.	ABEGN 271
0.	0.	0.	0.	0.	ABEGN 272
0.	0.	0.	0.	0.	ABEGN 273
0.	0.	0.	0.	0.	ABEGN 274
0.	0.	0.	0.	0.	ABEGN 275
0.	0.	0.	0.	0.	ABEGN 276
0.	0.	0.	0.	0.	ABEGN 277
0.	0.	0.	0.	0.	ABEGN 278
0.	0.	0.	0.	0.	ABEGN 279
0.	0.	0.	0.	0.	ABEGN 280
P239TH					ABEGN 281
.500000E-03	.340000E-02	.550000E-02	.240000E-02	.200000E-03	ABEGN 282
0.	.100000E-03	.410000E-02	.114000E-01	.850000E-02	ABEGN 283
.140000E-02	0.	0.	0.	.510000E-02	ABEGN 284
.232000E-01	.265000E-01	.760000E-02	.100000E-03	0.	ABEGN 285
.350000E-02	.344000E-01	.682000E-01	.344000E-01	.180000E-02	ABEGN 286
.180000E-02	0.	.400000E-03	.379000E-01	.131000E+00	ABEGN 287
.115000E+00	.253000E-01	0.	0.	0.	ABEGN 288
.302000E-01	.171000E+00	.237000E+00	.422000E-01	.211000E-01	ABEGN 289
.720000E-03	0.	0.	.101000E-01	.227000E+00	ABEGN 290
.545000E+00	.347000E+00	.255000E-01	.127500E-01	0.	ABEGN 291
0.	.248000E+00	.987000E+00	.987000E+00	.248000E+00	ABEGN 292
0.	0.	0.	0.	.179000E+00	ABEGN 293
.133000E+01	.227000E+01	.100000E+01	.597000E-01	0.	ABEGN 294
.395000E-01	.154000E+01	.435000E+01	.312000E+01	.273700E+00	ABEGN 295
.136850E+00	0.	0.	.109000E+01	.567000E+01	ABEGN 296
.734000E+01	.245000E+01	.468000E-01	0.	0.	ABEGN 297
.261000E+00	.559000E+01	.135000E+02	.314070E+01	.267385E+01	ABEGN 298
.423333E+00	0.	0.	0.	.417000E+01	ABEGN 299
.181000E+02	.195000E+02	.516000E+01	0.	0.	ABEGN 300

.134000E+01	.130000E+02	.256000E+02	.130000E+02	.666800E+00	ABEGN	301
.666800E+00	0.	.215000E+00	.113000E+02	.337000E+02	ABEGN	302
.260000E+02	.498000E+01	0.	0.	0.	ABEGN	303
0.	.336000E+01	.251000E+02	.428000E+02	.945000E+01	ABEGN	304
.560000E+00	0.	0.	.840000E+00	.250000E+02	ABEGN	305
.647000E+02	.217000E+02	.356000E+01	0.	0.	ABEGN	306
.153000E+02	.663000E+02	.357500E+02	.945000E+01	0.	ABEGN	307
0.	0.	0.	.699000E+01	.575000E+02	ABEGN	308
.106000E+03	.503000E+02	.399000E+01	0.	0.	ABEGN	309
.792000E+00	.416000E+02	.125000E+03	.104488E+03	.184000E+02	ABEGN	310
0.	0.	0.	0.	.203000E+02	ABEGN	311
.106000E+03	.137000E+03	.460000E+02	.875000E+00	0.	ABEGN	312
0.	.488000E+01	.821000E+02	.187000E+03	.109000E+03	ABEGN	313
.146000E+02	0.	0.	0.	0.	ABEGN	314
.450000E+02	.179000E+03	.179000E+03	.450000E+02	0.	ABEGN	315
0.	.217000E+02	.147000E+03	.232000E+03	.968000E+02	ABEGN	316
.430000E+01	0.	0.	0.	0.	ABEGN	317
.213000E+01	.830000E+02	.234000E+03	.168000E+03	.296000E+02	ABEGN	318
0.	0.	0.	0.	.412000E+02	ABEGN	319
.201000E+03	.243000E+03	.373669E+02	.186835E+02	.107000E+01	ABEGN	320
0.	.349000E+01	.103000E+03	.268000E+03	.180000E+03	ABEGN	321
.147279E+02	.147279E+02	0.	0.	.351000E+02	ABEGN	322
.199000E+03	.277000E+03	.984000E+02	.252000E+01	0.	ABEGN	323
0.	0.	.200000E+01	.105000E+03	.314000E+03	ABEGN	324
.242000E+03	.465000E+02	0.	0.	0.	ABEGN	325
.218000E+02	.162000E+03	.277000E+03	.122000E+03	.727000E+01	ABEGN	326
0.	0.	.248000E+01	.965000E+02	.272000E+03	ABEGN	327
.194000E+03	.171162E+02	.171162E+02	0.	0.	ABEGN	328
.563000E+02	.225000E+03	.225000E+03	.563000E+02	0.	ABEGN	329
0.	0.	0.	.145000E+02	.141000E+03	ABEGN	330
.280000E+03	.141000E+03	.145000E+02	0.	0.	ABEGN	331
0.	0.	.640000E+01	.108000E+03	.244000E+03	ABEGN	332
.143000E+03	.192000E+02	0.	0.	0.	ABEGN	333
0.	.272000E+01	.806000E+02	.210000E+03	.140000E+03	ABEGN	334
.231000E+02	0.	0.	0.	.971000E+00	ABEGN	335
.510000E+02	.153000E+03	.118000E+03	.226000E+02	0.	ABEGN	336
0.	0.	0.	0.	.169000E+02	ABEGN	337
.879000E+02	.113000E+03	.380000E+02	.724000E+00	0.	ABEGN	338
0.	.171000E+01	.286000E+02	.653000E+02	.383000E+02	ABEGN	339
.254750E+01	.127375E+01	0.	0.	0.	ABEGN	340
0.	0.	.751000E+01	.300000E+02	.300000E+02	ABEGN	341
.751000E+01	0.	0.	.851000E+00	.636000E+01	ABEGN	342
.108000E+02	.478000E+01	.141800E+00	.709000E-01	0.	ABEGN	343
0.	0.	.390000E-01	.204000E+00	.612000E+01	ABEGN	344
.473000E+01	.902000E+00	0.	0.	0.	ABEGN	345
.889000E+00	.432000E+01	.523000E+01	.162000E+01	.116000E-01	ABEGN	346
.116000E-01	0.	0.	.979000E-01	.124000E+01	ABEGN	347
.260000E+01	.141000E+01	.172000E+00	0.	0.	ABEGN	348
.452000E+00	.170000E+01	.158000E+01	.182100E+00	.910500E-01	ABEGN	349
0.	0.	0.	0.	0.	ABEGN	350
0.	.162000E+00	.110000E+01	.174000E+01	.719000E+00	ABEGN	351
.322000E-01	0.	.149000E-01	.579000E+00	.163000E+01	ABEGN	352
.117000E+01	.102500E+00	.512500E-01	0.	0.	ABEGN	353
0.	0.	0.	.261000E+00	.127000E+01	ABEGN	354
.153000E+01	.476000E+00	.340000E-02	.340000E-02	0.	ABEGN	355
0.	.641000E-01	.807000E+00	.170000E+01	.459300E+00	ABEGN	356
.459300E+00	.279000E-01	.279000E-01	0.	0.	ABEGN	357
0.	.413000E+00	.156000E+01	.144000E+01	.334000E+00	ABEGN	358
0.	0.	.190000E+00	.128000E+01	.202000E+01	ABEGN	359
.416000E+00	.416000E+00	.186000E-01	.930000E-02	0.	ABEGN	360

.910000E-02	.639000E+00	.206000E+01	.171000E+01	.350000E+00	ABEGN 361
0.	0.	0.	0.	.415000E+00	ABEGN 362
.202000E+01	.121910E+01	.121910E+01	.376700E+00	.186350E+00	ABEGN 363
.107000E-01	0.	.125000E+00	.157000E+01	.331000E+01	ABEGN 364
.180000E+01	.723000E-01	.723000E-01	.723000E-01	0.	ABEGN 365
0.	.105000E+01	.395000E+01	.182110E+01	.182110E+01	ABEGN 366
.423500E+00	0.	0.	0.	.827000E+00	ABEGN 367
.505000E+01	.753000E+01	.144300E+01	.144300E+01	.975000E-01	ABEGN 368
0.	.229000E+00	.681000E+01	0.	.177000E+02	ABEGN 369
.595000E+01	.485150E+00	.242575E+00	0.	.111000E+00	ABEGN 370
.104000E+02	.359000E+02	.157230E+02	.157230E+02	.693000E+01	ABEGN 371
0.	0.	0.	.151000E+02	.655000E+02	ABEGN 372
.706000E+02	.930440E+01	.465220E+01	0.	0.	ABEGN 373
0.	0.	.177000E+02	.926000E+02	0.	ABEGN 374
.119000E+03	.400000E+02	.762000E+00	0.	0.	ABEGN 375
.139000E+02	.104000E+03	.177000E+03	.388596E+02	.194298E+02	ABEGN 376
.155000E+01	0.	0.	0.	.216000E+01	ABEGN 377
.841000E+02	.237000E+03	.170000E+03	.300000E+02	0.	ABEGN 378
0.	.505000E+02	.246000E+03	.148274E+03	.741366E+02	ABEGN 379
.307000E+02	.217267E+00	.108633E+00	0.	0.	ABEGN 380
.307000E+01	.121000E+03	.339000E+03	.242000E+03	.428000E+02	ABEGN 381
0.	0.	0.	0.	.308000E+02	ABEGN 382
.208000E+03	.331000E+03	.676684E+02	.338342E+02	.305000E+01	ABEGN 383
0.	.867000E+00	.813000E+02	.279000E+03	.246000E+03	ABEGN 384
.540000E+02	0.	0.	.335000E+02	.204000E+03	ABEGN 385
.152000E+03	.585000E+02	.980200E+00	.196040E+01	0.	ABEGN 386
.376000E+01	.112000E+03	.145000E+03	.970000E+02	.319000E+02	ABEGN 387
0.	0.	0.	.523000E+02	.226000E+03	ABEGN 388
.244000E+03	.647000E+02	0.	0.	.175000E+02	ABEGN 389
.144000E+03	.265000E+03	.126000E+03	.998000E+01	0.	ABEGN 390
.102000E+01	.714000E+02	.231000E+03	.191000E+03	.391000E+02	ABEGN 391
0.	0.	0.	.328000E+02	.171000E+03	ABEGN 392
.221000E+03	.741000E+02	.141000E+01	0.	.560000E+01	ABEGN 393
.941000E+02	.214000E+03	.126000E+03	.168000E+02	0.	ABEGN 394
0.	0.	.392000E+02	.156000E+03	.156000E+03	ABEGN 395
.392000E+02	0.	0.	0.	.135000E+02	ABEGN 396
.909000E+02	.144000E+03	.596000E+02	.266000E+01	0.	ABEGN 397
0.	.108000E+01	.420000E+02	.118000E+03	.848000E+02	ABEGN 398
.149000E+02	0.	0.	.149500E+02	.727150E+02	ABEGN 399
.881070E+02	.273340E+02	.389200E+01	0.	0.	ABEGN 400
0.	.420000E+01	.406000E+02	.804000E+02	.406000E+02	ABEGN 401
.420000E+01	0.	0.	0.	.145000E+02	ABEGN 402
.548000E+02	.509000E+02	.118000E+02	0.	0.	ABEGN 403
0.	.505000E+01	.308000E+02	.460000E+02	.177000E+02	ABEGN 404
.596000E+00	0.	.154000E+00	.107000E+02	.347000E+02	ABEGN 405
.287000E+02	.590000E+01	0.	0.	0.	ABEGN 406
.311000E+01	.190000E+02	.283000E+02	.109000E+02	.367000E+00	ABEGN 407
0.	0.	0.	0.	.161000E+00	ABEGN 408
.423000E+01	.177000E+02	.127000E+02	.224000E+01	0.	ABEGN 409
0.	.214000E+01	.104000E+02	.126000E+02	.390000E+01	ABEGN 410
.557000E-01	0.	0.	.571000E+00	.552000E+01	ABEGN 411
.109000E+02	.552000E+01	.571000E+00	0.	.144000E-01	ABEGN 412
.135000E+01	.466000E+01	.411000E+01	.899000E+00	0.	ABEGN 413
0.	.437000E+00	.247000E+01	.344000E+01	.122000E+01	ABEGN 414
.314000E-01	0.	.523000E-01	.879000E+00	.199000E+01	ABEGN 415
.117000E+01	.156000E+00	0.	.211000E+00	.842000E+00	ABEGN 416
.842000E+00	.211000E+00	0.	.430000E-01	.290000E+00	ABEGN 417
.459000E+00	.189000E+00	.850000E-02	0.	0.	ABEGN 418
0.	.160000E-02	.629000E-01	.177000E+00	.127000E+00	ABEGN 419
.224000E-01	0.	0.	0.	0.	ABEGN 420

U233FI					ABEGN 421
0.	0.	0.	0.	0.	ABEGN 422
0.	0.	0.	0.	0.	ABEGN 423
0.	0.	0.	0.	0.	ABEGN 424
0.	0.	0.	0.	0.	ABEGN 425
0.	0.	0.	0.	0.	ABEGN 426
0.	0.	0.	0.	0.	ABEGN 427
0.	0.	0.	0.	0.	ABEGN 428
0.	0.	0.	0.	0.	ABEGN 429
0.	0.	0.	0.	0.	ABEGN 430
0.	0.	0.	0.	0.	ABEGN 431
0.	0.	0.	0.	0.	ABEGN 432
0.	0.	0.	0.	.162000E+00	ABEGN 433
.361000E+01	.874000E+01	.551000E+01	.817000E+00	0.	ABEGN 434
0.	.490000E+01	.212000E+02	.228000E+02	.308020E+01	ABEGN 435
.154010E+01	0.	0.	.291000E+01	.240000E+02	ABEGN 436
.442000E+02	.210000E+02	.166000E+01	0.	0.	ABEGN 437
.201000E+00	.188000E+02	.650000E+02	.216729E+02	.143647E+02	ABEGN 438
.416667E+01	0.	0.	0.	.990000E+01	ABEGN 439
.604000E+02	.901000E+02	.347000E+02	.117000E+01	0.	ABEGN 440
.105000E+01	.408000E+02	.115000E+03	.824000E+02	.738220E+01	ABEGN 441
.738220E+01	0.	.234000E+02	.114000E+03	.138000E+03	ABEGN 442
.427000E+02	.610000E+00	0.	0.	0.	ABEGN 443
0.	.683000E+01	.861000E+02	.181000E+03	.492000E+02	ABEGN 444
.600000E+01	0.	0.	0.	.512000E+02	ABEGN 445
.193000E+03	.895000E+02	.207000E+02	0.	0.	ABEGN 446
.268000E+02	.163500E+03	.121950E+03	.469000E+02	.150000E+01	ABEGN 447
0.	0.	0.	.373000E+01	.111000E+03	ABEGN 448
.288000E+03	.193000E+03	.317000E+02	0.	0.	ABEGN 449
0.	.529000E+02	.242000E+03	.278994E+03	.797000E+02	ABEGN 450
.432300E+00	.216150E+00	0.	0.	.211000E+02	ABEGN 451
.173000E+03	.319000E+03	.152000E+03	.120000E+02	0.	ABEGN 452
0.	.131000E+01	.920000E+02	.298000E+03	.246000E+03	ABEGN 453
.505000E+02	0.	0.	0.	.373000E+02	ABEGN 454
.212000E+03	.295000E+03	.105000E+03	.269000E+01	0.	ABEGN 455
0.	.513000E+01	.115000E+03	.277000E+03	.175000E+03	ABEGN 456
.259000E+02	0.	0.	0.	0.	ABEGN 457
0.	.558000E+02	.223000E+03	.223000E+03	.558000E+02	ABEGN 458
0.	0.	0.	.199000E+02	.149000E+03	ABEGN 459
.254000E+03	.112000E+03	.339070E+01	.169535E+01	0.	ABEGN 460
0.	0.	.568000E+02	.214000E+03	.199000E+03	ABEGN 461
.233683E+02	.233683E+02	0.	0.	.116000E+02	ABEGN 462
.113000E+03	.223000E+03	.113000E+03	.116000E+02	0.	ABEGN 463
0.	0.	0.	.352000E+02	.161000E+03	ABEGN 464
.183000E+03	.531000E+02	.566000E+00	0.	0.	ABEGN 465
.294000E+01	.657000E+02	.159000E+03	.100000E+03	.149000E+02	ABEGN 466
0.	0.	0.	.255000E+02	.102000E+03	ABEGN 467
.102000E+03	.129824E+02	.129824E+02	0.	0.	ABEGN 468
.950000E+01	.580000E+02	.865000E+02	.333000E+02	.112000E+01	ABEGN 469
0.	0.	0.	.496000E+00	.194000E+02	ABEGN 470
.545000E+02	.391000E+02	.690000E+01	0.	0.	ABEGN 471
0.	0.	.165000E+00	.867000E+01	.260000E+02	ABEGN 472
.201000E+02	.364000E+01	0.	0.	0.	ABEGN 473
0.	0.	.396000E+01	.149000E+02	.139000E+02	ABEGN 474
.320000E+01	0.	0.	0.	0.	ABEGN 475
.249000E+01	.109000E+02	.116000E+02	.308000E+01	0.	ABEGN 476
0.	0.	0.	0.	.620000E+00	ABEGN 477
.510000E+01	.940000E+01	.446000E+01	.354000E+00	0.	ABEGN 478
0.	.285000E-01	.200000E+01	.645000E+01	.533000E+01	ABEGN 479
.560000E+00	.280000E+00	0.	0.	0.	ABEGN 480

0.	0.	.627000E+00	.355000E+01	.495000E+01	ABEGN 481
.176000E+01	.451000E-01	0.	.680000E-01	.152000E+01	ABEGN 482
.368000E+01	.232000E+01	.175200E+00	.876000E-01	0.	ABEGN 483
0.	0.	0.	.623000E+00	.270000E+01	ABEGN 484
.291000E+01	.770000E+00	0.	0.	0.	ABEGN 485
.198000E+00	.163000E+01	.301000E+01	.143000E+01	.579000E-01	ABEGN 486
.579000E-01	0.	0.	.116000E+00	.611000E+00	ABEGN 487
.262000E+01	.217000E+01	.445000E+00	0.	0.	ABEGN 488
.452000E+00	.237000E+01	.306000E+01	.520000E-01	.260000E-01	ABEGN 489
.333333E-02	.333333E-02	0.	0.	0.	ABEGN 490
0.	.732000E-01	.123000E+01	.279000E+01	.164000E+01	ABEGN 491
.219000E+00	0.	0.	.604000E+00	.241000E+01	ABEGN 492
.241000E+01	.307500E+00	.153750E+00	0.	0.	ABEGN 493
0.	0.	0.	.226000E+00	.169000E+01	ABEGN 494
.288000E+01	.127000E+01	.385000E-01	.385000E-01	0.	ABEGN 495
0.	.185000E-01	.970000E+00	.290000E+01	.114040E+01	ABEGN 496
.114040E+01	.109200E+00	.109200E+00	0.	0.	ABEGN 497
0.	.494000E+00	.258000E+01	.234000E+01	.112000E+01	ABEGN 498
.213000E-01	0.	.134000E+00	.226000E+01	.512000E+01	ABEGN 499
.152740E+01	.152740E+01	.204700E+00	.102350E+00	0.	ABEGN 500
0.	.113000E+01	.518000E+01	.588000E+01	.171000E+01	ABEGN 501
.930000E-02	.930000E-02	0.	0.	.694000E+00	ABEGN 502
.519000E+01	.450060E+01	.450060E+01	.198560E+01	.992800E+00	ABEGN 503
.232000E+00	0.	.728000E-01	.382000E+01	.114000E+02	ABEGN 504
.884000E+01	.573600E+00	.573600E+00	.573600E+00	0.	ABEGN 505
0.	.226000E+01	.119000E+02	.784040E+01	.784040E+01	ABEGN 506
.257500E+01	.249500E-01	.499000E-01	0.	.561000E+00	ABEGN 507
.943000E+01	.214000E+02	.641490E+01	.641490E+01	.168000E+01	ABEGN 508
0.	0.	.614000E+01	0.	.245000E+02	ABEGN 509
.122500E+02	.156300E+01	.781500E+00	0.	0.	ABEGN 510
.635000E+01	.309000E+02	.190409E+02	.190409E+02	.116000E+02	ABEGN 511
.165000E+00	0.	0.	.685000E+01	.418000E+02	ABEGN 512
.623000E+02	.122187E+02	.610935E+01	.269333E+00	0.	ABEGN 513
0.	0.	.828000E+01	.681000E+02	0.	ABEGN 514
.126000E+03	.595000E+02	.473000E+01	0.	0.	ABEGN 515
.328000E+01	.733000E+02	.775000E+02	.610936E+02	.305468E+02	ABEGN 516
.553333E+01	0.	0.	0.	0.	ABEGN 517
.174000E+02	.117000E+03	.186000E+03	.769000E+02	.344000E+01	ABEGN 518
0.	.192000E+01	.747000E+02	.106914E+03	.534569E+02	ABEGN 519
.503333E+02	.453110E+01	.226555E+01	0.	0.	ABEGN 520
0.	.226000E+02	.152000E+03	.241000E+03	.999000E+02	ABEGN 521
.227070E+01	.227070E+01	0.	0.	0.	ABEGN 522
.599000E+02	.227000E+03	.106914E+03	.534569E+02	.243000E+02	ABEGN 523
0.	0.	.429000E+02	.224000E+03	.291000E+03	ABEGN 524
.971000E+02	.185000E+01	0.	.116000E+02	.147000E+03	ABEGN 525
.154500E+03	.840000E+02	.519295E+01	.103859E+02	0.	ABEGN 526
0.	.674000E+02	.127000E+03	.118000E+03	.546000E+02	ABEGN 527
0.	0.	0.	.270000E+02	.182000E+03	ABEGN 528
.289000E+03	.119000E+03	.534000E+01	0.	.379000E+01	ABEGN 529
.113000E+03	.293000E+03	.196000E+03	.322000E+02	0.	ABEGN 530
0.	.545000E+02	.249000E+03	.283000E+03	.621000E+02	ABEGN 531
.875000E+00	0.	0.	.167000E+02	.162000E+03	ABEGN 532
.321000E+03	.162000E+03	.167000E+02	0.	.115000E+01	ABEGN 533
.802000E+02	.259000E+03	.214000E+03	.440000E+02	0.	ABEGN 534
0.	0.	.282000E+02	.160000E+03	.223000E+03	ABEGN 535
.792000E+02	.203000E+01	0.	.294000E+01	.657000E+02	ABEGN 536
.159000E+03	.100000E+03	.149000E+02	0.	0.	ABEGN 537
0.	0.	.254000E+02	.102000E+03	.102000E+03	ABEGN 538
.254000E+02	0.	0.	.610000E+01	.486000E+02	ABEGN 539
.828000E+02	.365000E+02	.217000E+01	0.	0.	ABEGN 540

0.	.333000E+00	.175000E+02	.524000E+02	.405000E+02	ABEGN 541
.774000E+01	0.	0.	0.	.450000E+01	ABEGN 542
.255000E+02	.356000E+02	.126000E+02	.324000E+00	0.	ABEGN 543
0.	.295000E+00	.875000E+01	.228000E+02	.153000E+02	ABEGN 544
.250000E+01	0.	0.	.204000E+01	.994000E+01	ABEGN 545
.120000E+02	.372000E+01	.632000E-01	0.	0.	ABEGN 546
0.	.207000E+00	.349000E+01	.791000E+01	.464000E+01	ABEGN 547
.316200E+00	.316200E+00	0.	0.	0.	ABEGN 548
.900000E+00	.359000E+01	.359000E+01	.900000E+00	0.	ABEGN 549
0.	.183000E+00	.137000E+01	.233000E+01	.103000E+01	ABEGN 550
.610000E-01	0.	0.	.103000E-01	.400000E+00	ABEGN 551
.113000E+01	.808000E+00	.143000E+00	0.	0.	ABEGN 552
.949000E-01	.462000E+00	.559000E+00	.173000E+00	.250000E-02	ABEGN 553
0.	0.	0.	0.	0.	ABEGN 554
0.	0.	0.	0.	0.	ABEGN 555
0.	0.	0.	0.	0.	ABEGN 556
0.	0.	0.	0.	0.	ABEGN 557
0.	0.	0.	0.	0.	ABEGN 558
0.	0.	0.	0.	0.	ABEGN 559
0.	0.	0.	0.	0.	ABEGN 560
U233HE					ABEGN 561
0.	0.	0.	0.	0.	ABEGN 562
0.	0.	0.	0.	0.	ABEGN 563
0.	0.	0.	0.	0.	ABEGN 564
0.	0.	0.	0.	0.	ABEGN 565
0.	0.	0.	0.	0.	ABEGN 566
0.	0.	0.	0.	0.	ABEGN 567
0.	0.	0.	0.	0.	ABEGN 568
0.	0.	0.	0.	0.	ABEGN 569
0.	0.	0.	0.	0.	ABEGN 570
0.	0.	0.	0.	0.	ABEGN 571
0.	0.	0.	0.	0.	ABEGN 572
0.	0.	0.	0.	.100000E+01	ABEGN 573
.169000E+02	.382000E+02	.224000E+02	.300000E+01	0.	ABEGN 574
0.	.469000E+01	.316000E+02	.501000E+02	.105964E+02	ABEGN 575
.529820E+01	.926000E+00	0.	.397000E+00	.208000E+02	ABEGN 576
.624000E+02	.482000E+02	.921000E+01	0.	0.	ABEGN 577
0.	.115000E+02	.598000E+02	.340742E+02	.225841E+02	ABEGN 578
.860000E+01	.839667E-01	.251900E+00	0.	.186000E+01	ABEGN 579
.417000E+02	.101000E+03	.637000E+02	.944000E+01	0.	ABEGN 580
0.	.211000E+02	.966000E+02	.110000E+03	.163297E+02	ABEGN 581
.163297E+02	.340000E+00	0.	.829000E+01	.802000E+02	ABEGN 582
.159000E+03	.802000E+02	.424370E+01	.424370E+01	0.	ABEGN 583
0.	.750000E+00	.525000E+02	.170000E+03	.700000E+02	ABEGN 584
.144000E+02	0.	0.	0.	.247000E+02	ABEGN 585
.140000E+03	.970000E+02	.346500E+02	.170000E+01	0.	ABEGN 586
.400000E+01	.894000E+02	.108500E+03	.680000E+02	.101000E+02	ABEGN 587
0.	0.	0.	0.	.490000E+02	ABEGN 588
.196000E+03	.196000E+03	.490000E+02	0.	0.	ABEGN 589
0.	.188000E+02	.140000E+03	.244689E+03	.106000E+03	ABEGN 590
.321480E+01	.160740E+01	0.	0.	.149000E+01	ABEGN 591
.780000E+02	.233000E+03	.181000E+03	.345000E+02	0.	ABEGN 592
0.	0.	.350000E+02	.183000E+03	.237000E+03	ABEGN 593
.790000E+02	.150000E+01	0.	0.	0.	ABEGN 594
.940000E+01	.119000E+03	.250000E+03	.135000E+03	.164000E+02	ABEGN 595
0.	0.	.573000E+02	.216000E+03	.201000E+03	ABEGN 596
.464000E+02	0.	0.	0.	0.	ABEGN 597
0.	.218000E+02	.147000E+03	.233000E+03	.963000E+02	ABEGN 598
.430000E+01	0.	0.	0.	.285000E+01	ABEGN 599
.846000E+02	.220000E+03	.752496E+02	.376248E+02	.242000E+02	ABEGN 600

0.	0.	.223000E+02	.136000E+03	.202000E+03	ABEGN 601
.398260E+02	.398260E+02	.263000E+01	0.	.782000E+00	ABEGN 602
.548000E+02	.177000E+03	.147000E+03	.301000E+02	0.	ABEGN 603
0.	0.	0.	.136000E+02	.102000E+03	ABEGN 604
.151000E+03	.763000E+02	.455000E+01	0.	0.	ABEGN 605
0.	.357000E+02	.135000E+03	.125000E+03	.288000E+02	ABEGN 606
0.	0.	0.	.114000E+02	.695000E+02	ABEGN 607
.104000E+03	.204249E+02	.204249E+02	.135000E+01	0.	ABEGN 608
.203000E+01	.341000E+02	.774000E+02	.454000E+02	.607000E+01	ABEGN 609
0.	0.	0.	.113000E+02	.517000E+02	ABEGN 610
.587000E+02	.171000E+02	.182000E+00	0.	0.	ABEGN 611
0.	0.	0.	.926000E+01	.451000E+02	ABEGN 612
.545000E+02	.168000E+02	.123400E+00	.617000E-01	0.	ABEGN 613
0.	0.	.591000E+01	.360000E+02	.537000E+02	ABEGN 614
.206000E+02	.356800E+00	.356800E+00	0.	0.	ABEGN 615
.394000E+01	.294000E+02	.501000E+02	.221000E+02	.675700E+00	ABEGN 616
.337850E+00	0.	0.	0.	.424000E+00	ABEGN 617
.166000E+02	.466000E+02	.335000E+02	.590000E+01	0.	ABEGN 618
0.	0.	.715000E+01	.347000E+02	.422000E+02	ABEGN 619
.665470E+01	.332735E+01	.476000E-01	.238000E-01	0.	ABEGN 620
0.	0.	.170000E+00	.214000E+02	.451000E+02	ABEGN 621
.245000E+02	.298000E+00	0.	0.	.103000E+02	ABEGN 622
.392000E+02	.364000E+02	.430510E+01	.215255E+01	0.	ABEGN 623
0.	0.	0.	.397000E+01	.268000E+02	ABEGN 624
.424000E+02	.175000E+02	.784000E+00	0.	0.	ABEGN 625
.371000E+00	.145000E+02	.407000E+02	.293000E+02	.264140E+01	ABEGN 626
.264140E+01	0.	0.	0.	.659000E+01	ABEGN 627
.320000E+02	.388000E+02	.120000E+02	.172000E+00	0.	ABEGN 628
.159000E+00	.200000E+02	.422000E+02	.117738E+02	.588690E+01	ABEGN 629
.474367E+00	.474367E+00	0.	0.	0.	ABEGN 630
0.	0.	.985000E+01	.372000E+02	.345000E+02	ABEGN 631
.799000E+01	0.	0.	.389000E+01	.262000E+02	ABEGN 632
.415000E+02	.880470E+01	.440235E+01	.131067E+00	.983000E-01	ABEGN 633
0.	0.	0.	.376000E+00	.146000E+02	ABEGN 634
.413000E+02	.296000E+02	.267220E+01	.267220E+01	0.	ABEGN 635
0.	.754000E+01	.345000E+02	.391000E+02	.578450E+01	ABEGN 636
.578450E+01	.310000E-01	.310000E-01	0.	0.	ABEGN 637
0.	.237000E+01	.230000E+02	.456000E+02	.230000E+02	ABEGN 638
.237000E+01	0.	.131000E+00	.122000E+02	.423000E+02	ABEGN 639
.190428E+02	.190428E+02	.416690E+01	.208345E+01	0.	ABEGN 640
0.	.390000E+01	.292000E+02	.497000E+02	.219000E+02	ABEGN 641
.665500E+00	.665500E+00	0.	0.	.679000E+00	ABEGN 642
.201000E+02	.267725E+02	.267725E+02	.179678E+02	.898390E+01	ABEGN 643
.575000E+01	0.	0.	.101000E+02	.461000E+02	ABEGN 644
.524000E+02	.518730E+01	.518730E+01	.518730E+01	.162000E+00	ABEGN 645
0.	.325000E+01	.315000E+02	.319939E+02	.319939E+02	ABEGN 646
.157500E+02	.831850E+00	.166370E+01	0.	.203000E+00	ABEGN 647
.190000E+02	.655000E+02	.294856E+02	.294856E+02	.126000E+02	ABEGN 648
0.	0.	.933000E+01	0.	.569000E+02	ABEGN 649
.424500E+02	.836960E+01	.418480E+01	.111000E+01	0.	ABEGN 650
.642000E+01	.528000E+02	.496545E+02	.496545E+02	.461000E+02	ABEGN 651
.366000E+01	0.	0.	.281000E+01	.472000E+02	ABEGN 652
.107000E+03	.321986E+02	.160993E+02	.281333E+01	0.	ABEGN 653
0.	0.	.816000E+00	.428000E+02	0.	ABEGN 654
.128000E+03	.991000E+02	.189000E+02	0.	0.	ABEGN 655
.375000E+02	.142000E+03	.132000E+03	.155618E+02	.778090E+01	ABEGN 656
0.	0.	0.	0.	0.	ABEGN 657
.174000E+02	.117000E+03	.186000E+03	.769000E+02	.344000E+01	ABEGN 658
0.	.192000E+01	.747000E+02	.107499E+03	.537497E+02	ABEGN 659
.503333E+02	.455593E+01	.227797E+01	0.	0.	ABEGN 660

0.	.226000E+02	.152000E+03	.241000E+03	.999000E+02	ABEGN 661
.228310E+01	.228310E+01	0.	0.	0.	ABEGN 662
.599000E+02	.227000E+03	.107499E+03	.537497E+02	.243000E+02	ABEGN 663
0.	0.	.135000E+02	.130000E+03	.259000E+03	ABEGN 664
.130000E+03	.135000E+02	0.	.693000E+00	.651000E+02	ABEGN 665
.112000E+03	.985000E+02	.110571E+02	.221142E+02	0.	ABEGN 666
0.	.297000E+02	.835000E+02	.117000E+03	.832000E+02	ABEGN 667
.213000E+01	0.	0.	.418000E+01	.930000E+02	ABEGN 668
.226000E+03	.143000E+03	.211000E+02	0.	0.	ABEGN 669
.415000E+02	.180000E+03	.194000E+03	.515000E+02	0.	ABEGN 670
0.	.163000E+02	.122000E+03	.207000E+03	.916000E+02	ABEGN 671
.545000E+01	0.	0.	.118000E+01	.619000E+02	ABEGN 672
.185000E+03	.143000E+03	.274000E+02	0.	0.	ABEGN 673
.256000E+02	.134000E+03	.173000E+03	.578000E+02	.111000E+01	ABEGN 674
0.	0.	.643000E+01	.809000E+02	.171000E+03	ABEGN 675
.925000E+02	.112000E+02	0.	0.	0.	ABEGN 676
.343000E+02	.129000E+03	.119000E+03	.276000E+02	0.	ABEGN 677
0.	0.	.110000E+02	.745000E+02	.118000E+03	ABEGN 678
.489000E+02	.218000E+01	0.	.121000E+01	.358000E+02	ABEGN 679
.932000E+02	.625000E+02	.102000E+02	0.	0.	ABEGN 680
0.	0.	.132000E+02	.603000E+02	.684000E+02	ABEGN 681
.198000E+02	.212000E+00	0.	0.	.228000E+01	ABEGN 682
.286000E+02	.604000E+02	.328000E+02	.398000E+01	0.	ABEGN 683
0.	.955000E+01	.382000E+02	.382000E+02	.955000E+01	ABEGN 684
0.	0.	0.	0.	0.	ABEGN 685
0.	0.	0.	0.	0.	ABEGN 686
0.	0.	0.	0.	0.	ABEGN 687
0.	0.	0.	0.	0.	ABEGN 688
0.	0.	0.	0.	0.	ABEGN 689
0.	0.	0.	0.	0.	ABEGN 690
0.	0.	0.	0.	0.	ABEGN 691
0.	0.	0.	0.	0.	ABEGN 692
0.	0.	0.	0.	0.	ABEGN 693
0.	0.	0.	0.	0.	ABEGN 694
0.	0.	0.	0.	0.	ABEGN 695
0.	0.	0.	0.	0.	ABEGN 696
0.	0.	0.	0.	0.	ABEGN 697
0.	0.	0.	0.	0.	ABEGN 698
0.	0.	0.	0.	0.	ABEGN 699
0.	0.	0.	0.	0.	ABEGN 700
U233TH					ABEGN 701
.100000E-03	.190000E-02	.460000E-02	.290000E-02	.400000E-03	ABEGN 702
0.	0.	.337000E-02	.132000E-01	.132000E-01	ABEGN 703
.337000E-02	0.	0.	0.	.404000E-02	ABEGN 704
.263000E-01	.417000E-01	.172000E-01	.609000E-03	0.	ABEGN 705
.931000E-03	.370000E-01	.104000E+00	.747000E-01	.610000E-02	ABEGN 706
.610000E-02	0.	0.	.501000E-01	.244000E+00	ABEGN 707
.294000E+00	.912000E-01	.121000E-02	0.	0.	ABEGN 708
.515000E-01	.496000E+00	.987000E+00	.249200E+00	.124600E+00	ABEGN 709
.171667E-01	0.	0.	.630000E-02	.588000E+00	ABEGN 710
.203000E+01	.179000E+01	.195700E+00	.978500E-01	0.	ABEGN 711
0.	.554000E+00	.339000E+01	.505000E+01	.194000E+01	ABEGN 712
.327000E-01	.327000E-01	0.	0.	.202000E+00	ABEGN 713
.452000E+01	.109000E+02	.690000E+01	.103000E+01	0.	ABEGN 714
0.	.390000E+01	.170000E+02	.183000E+02	.242170E+01	ABEGN 715
.121085E+01	0.	0.	.230000E+01	.189000E+02	ABEGN 716
.349000E+02	.165000E+02	.131000E+01	0.	0.	ABEGN 717
.152000E+00	.143000E+02	.491000E+02	.203532E+02	.134900E+02	ABEGN 718
.316000E+01	0.	0.	0.	.979000E+01	ABEGN 719
.597000E+02	.690000E+02	.543000E+02	.115000E+01	0.	ABEGN 720

.103000E+01	.402000E+02	.113000E+03	.811000E+02	.715500E+01	ABEGN	721
.715500E+01	0.	0.	.241000E+02	.117000E+03	ABEGN	722
.142000E+03	.437000E+02	.313200E+00	.313200E+00	0.	ABEGN	723
0.	.805000E+01	.102000E+03	.213000E+03	.580000E+02	ABEGN	724
.705000E+01	0.	0.	0.	.592000E+02	ABEGN	725
.223000E+03	.103500E+03	.239500E+02	0.	0.	ABEGN	726
.295000E+02	.180000E+03	.134500E+03	.520000E+02	.174500E+01	ABEGN	727
0.	0.	0.	.381000E+01	.114000E+03	ABEGN	728
.295000E+03	.198000E+03	.324000E+02	0.	0.	ABEGN	729
0.	.524000E+02	.239000E+03	.272191E+03	.789000E+02	ABEGN	730
.420800E+00	.210400E+00	0.	0.	.207000E+02	ABEGN	731
.170000E+03	.313000E+03	.149000E+03	.118000E+02	0.	ABEGN	732
0.	.134000E+01	.932000E+02	.302000E+03	.249000E+03	ABEGN	733
.512000E+02	.156000E+01	0.	0.	0.	ABEGN	734
.384000E+02	.217000E+03	.302000E+03	.108000E+03	.276000E+01	ABEGN	735
0.	.524000E+01	.117000E+03	.284000E+03	.179000E+03	ABEGN	736
.265900E+02	0.	0.	0.	0.	ABEGN	737
0.	.560000E+02	.223000E+03	.223000E+03	.560000E+02	ABEGN	738
0.	0.	0.	0.	.197000E+02	ABEGN	739
.148000E+03	.252000E+03	.555389E+02	.277695E+02	.659000E+01	ABEGN	740
0.	0.	.569000E+02	.214000E+03	.198000E+03	ABEGN	741
.229661E+02	.229661E+02	0.	0.	.119000E+02	ABEGN	742
.115000E+03	.227000E+03	.115000E+03	.119000E+02	0.	ABEGN	743
0.	0.	0.	.359000E+02	.164000E+03	ABEGN	744
.186000E+03	.542000E+02	.577000E+00	0.	0.	ABEGN	745
.221000E+02	.518000E+02	.125000E+03	.800000E+02	.117000E+02	ABEGN	746
0.	0.	0.	.220000E+02	.877000E+02	ABEGN	747
.877000E+02	.110077E+02	.110077E+02	0.	0.	ABEGN	748
.903000E+01	.551000E+02	.822000E+02	.316000E+02	.106000E+01	ABEGN	749
0.	0.	0.	.382000E+00	.149000E+02	ABEGN	750
.420000E+02	.302000E+02	.532000E+01	0.	0.	ABEGN	751
0.	0.	.142000E+00	.747000E+01	.223000E+02	ABEGN	752
.173000E+02	.331000E+01	0.	0.	0.	ABEGN	753
0.	0.	.263000E+01	.992000E+01	.920000E+01	ABEGN	754
.213000E+01	0.	0.	0.	0.	ABEGN	755
.154000E+01	.671000E+01	.723000E+01	.192000E+01	0.	ABEGN	756
0.	0.	0.	0.	.259000E+00	ABEGN	757
.212000E+01	.392000E+01	.185000E+01	.148000E+00	0.	ABEGN	758
0.	.830000E-02	.584000E+00	.189000E+01	.156000E+01	ABEGN	759
.160100E+00	.800500E-01	0.	0.	0.	ABEGN	760
0.	0.	.191000E+00	.109000E+01	.152000E+01	ABEGN	761
.538000E+00	.138000E-01	0.	.205000E-01	.458000E+00	ABEGN	762
.110000E+01	.699000E+00	.516000E-01	.258000E-01	0.	ABEGN	763
0.	0.	0.	.142000E+00	.616000E+00	ABEGN	764
.665000E+00	.176000E+00	0.	0.	0.	ABEGN	765
.482000E-01	.397000E+00	.731000E+00	.346000E+00	.138000E-01	ABEGN	766
.138000E-01	0.	0.	.294000E-02	.205000E+00	ABEGN	767
.663000E+00	.547000E+00	.113000E+00	0.	0.	ABEGN	768
.138000E+00	.718000E+00	.929000E+00	.155100E+00	.775500E-01	ABEGN	769
.100000E-02	.100000E-02	0.	0.	0.	ABEGN	770
0.	.187000E-01	.313000E+00	.709000E+00	.417000E+00	ABEGN	771
.322000E-01	0.	0.	.150000E+00	.600000E+00	ABEGN	772
.600000E+00	.751000E-01	.375500E-01	0.	0.	ABEGN	773
0.	0.	0.	.600000E-01	.418000E+00	ABEGN	774
.713000E+00	.314000E+00	.950000E-02	.950000E-02	0.	ABEGN	775
0.	.440000E-02	.232000E+00	.694000E+00	.268700E+00	ABEGN	776
.268700E+00	.258000E-01	.258000E-01	0.	0.	ABEGN	777
0.	.106000E+00	.554000E+00	.717000E+00	.239000E+00	ABEGN	778
.460000E-02	0.	.222000E-01	.373000E+00	.842000E+00	ABEGN	779
.248700E+00	.248700E+00	.332000E-01	.166000E-01	0.	ABEGN	780

0.	.840000E-01	.382000E+00	.434000E+00	.126000E+01	ABEGN 781
.700000E-03	.700000E-03	0.	0.	.127000E+00	ABEGN 782
.898000E+00	.765600E+00	.765600E+00	.341300E+00	.170650E+00	ABEGN 783
.394000E-01	0.	.160000E-01	.812000E+00	.243000E+01	ABEGN 784
.188000E+01	.119800E+00	.119800E+00	.119800E+00	0.	ABEGN 785
0.	.974000E+00	.509000E+01	.329730E+01	.329730E+01	ABEGN 786
.110000E+01	.105000E-01	.210000E-01	0.	.395000E+00	ABEGN 787
.666000E+01	.151000E+02	.443310E+01	.443310E+01	.119000E+01	ABEGN 788
0.	0.	.588000E+01	0.	.235000E+02	ABEGN 789
.117500E+02	.147105E+01	.735525E+00	0.	0.	ABEGN 790
.699000E+01	.339000E+02	.206145E+02	.206145E+02	.127000E+02	ABEGN 791
.182000E+00	0.	0.	.853000E+01	.523000E+02	ABEGN 792
.780000E+02	.150105E+02	.750525E+01	.336667E+00	0.	ABEGN 793
0.	0.	.684000E+01	.562000E+02	0.	ABEGN 794
.104000E+03	.492000E+02	.390000E+01	0.	0.	ABEGN 795
.291000E+01	.649000E+02	.157000E+03	.495847E+02	.247924E+02	ABEGN 796
.490000E+01	0.	0.	0.	0.	ABEGN 797
.413000E+02	.179000E+03	.193000E+03	.501000E+02	0.	ABEGN 798
0.	.212000E+02	.159000E+03	.135095E+03	.675473E+02	ABEGN 799
.393333E+02	.166450E+01	.832250E+00	0.	0.	ABEGN 800
0.	.595000E+02	.238000E+03	.238000E+03	.595000E+02	ABEGN 801
0.	0.	0.	0.	.741000E+01	ABEGN 802
.125000E+03	.282000E+03	.335565E+02	.417793E+02	.110500E+02	ABEGN 803
0.	0.	.433000E+02	.226000E+03	.294000E+03	ABEGN 804
.980000E+02	.187000E+01	0.	.116000E+02	.147000E+03	ABEGN 805
.154500E+03	.840000E+02	.513360E+01	.102072E+02	0.	ABEGN 806
0.	.701000E+02	.132500E+03	.122500E+03	.568000E+02	ABEGN 807
0.	0.	0.	.279000E+02	.188000E+03	ABEGN 808
.300000E+03	.124000E+03	.552000E+01	0.	.386000E+01	ABEGN 809
.114000E+03	.298000E+03	.199000E+03	.327000E+02	0.	ABEGN 810
0.	.539000E+02	.245000E+03	.279000E+03	.811000E+02	ABEGN 811
.864000E+00	0.	0.	.168000E+02	.163000E+03	ABEGN 812
.323000E+03	.163000E+03	.168000E+02	0.	.114000E+01	ABEGN 813
.802000E+02	.259000E+03	.215000E+03	.439000E+02	0.	BEGN 814
0.	0.	.263000E+02	.149000E+03	.207000E+03	ABEGN 815
.738000E+02	.189000E+01	0.	0.	.296000E+01	ABEGN 816
.666000E+02	.161000E+03	.101000E+03	.151000E+02	0.	ABEGN 817
0.	0.	.259000E+02	.104000E+03	.104000E+03	ABEGN 818
.259000E+02	0.	0.	.714000E+01	.534000E+02	ABEGN 819
.909000E+02	.401000E+02	.239000E+01	0.	0.	ABEGN 820
0.	.374000E+00	.196000E+02	.588000E+02	.455000E+02	ABEGN 821
.868000E+01	0.	0.	0.	.431000E+01	ABEGN 822
.244000E+02	.341000E+02	.122000E+02	.311000E+00	0.	ABEGN 823
0.	.326000E+00	.968000E+01	.252000E+02	.169000E+02	ABEGN 824
.278000E+01	0.	0.	.245000E+01	.119000E+02	ABEGN 825
.144000E+02	.446000E+01	.367000E-01	0.	0.	ABEGN 826
.267000E+00	.449000E+01	.102000E+02	.598000E+01	.799000E+00	ABEGN 827
0.	0.	0.	0.	0.	ABEGN 828
.129000E+01	.514000E+01	.514000E+01	.129000E+01	0.	ABEGN 829
0.	.163000E+00	.122000E+01	.207000E+01	.915000E+00	ABEGN 830
.544000E-01	0.	0.	.111000E-01	.439000E+00	ABEGN 831
.124000E+01	.886000E+00	.156000E+00	0.	0.	ABEGN 832
.810000E-01	.395000E+00	.477000E+00	.147000E+00	.210000E-02	ABEGN 833
0.	.116000E-01	.112000E+00	.223000E+00	.112000E+00	ABEGN 834
.116000E-01	0.	.300000E-03	.220000E-01	.759000E-01	ABEGN 835
.671000E-01	.146000E-01	0.	0.	0.	ABEGN 836
0.	0.	0.	0.	0.	ABEGN 837
0.	0.	0.	0.	0.	ABEGN 838
0.	0.	0.	0.	0.	ABEGN 839
0.	0.	0.	0.	0.	ABEGN 840

U235FI					ABEGN	841
.100000E-03	.190000E-02	.460000E-02	.190000E-02	.400000E-03	ABEGN	842
0.	0.	.337000E-02	.132000E-01	.132000E-01	ABEGN	843
.337000E-02	0.	0.	0.	.404000E-02	ABEGN	844
.263000E-01	.417000E-01	.172000E-01	.809000E-03	0.	ABEGN	845
.991000E-03	.370000E-01	.104000E+00	.747000E-01	.610000E-02	ABEGN	846
.610000E-02	0.	0.	.501000E-01	.244000E+00	ABEGN	847
.294000E+00	.912000E-01	.121000E-02	0.	0.	ABEGN	848
.515000E-01	.498000E+00	.987000E+00	.249200E+00	.124600E+00	ABEGN	849
.171667E-01	0.	0.	.630000E-02	.588000E+00	ABEGN	850
.203000E+01	.179000E+01	.195700E+00	.978500E-01	0.	ABEGN	851
0.	.554000E+00	.339000E+01	.505000E+01	.194000E+01	ABEGN	852
.327000E-01	.327000E-01	0.	0.	.202000E+00	ABEGN	853
.452000E+01	.109000E+02	.690000E+01	.103000E+01	0.	ABEGN	854
0.	.390000E+01	.170000E+02	.183000E+02	.242170E+01	ABEGN	855
.121085E+01	0.	0.	.230000E+01	.189000E+02	ABEGN	856
.349000E+02	.165000E+02	.131000E+01	0.	0.	ABEGN	857
.152000E+00	.143000E+02	.491000E+02	.203532E+02	.134900E+02	ABEGN	858
.316000E+01	0.	0.	0.	.979000E+01	ABEGN	859
.597000E+02	.890000E+02	.543000E+02	.115000E+01	0.	ABEGN	860
.103000E+01	.402000E+02	.113000E+03	.811000E+02	.715500E+01	ABEGN	861
.715500E+01	0.	0.	.241000E+02	.117000E+03	ABEGN	862
.142000E+03	.437000E+02	.313200E+00	.313200E+00	0.	ABEGN	863
0.	.805000E+01	.102000E+03	.213000E+03	.580000E+02	ABEGN	864
.705000E+01	0.	0.	0.	.592000E+02	ABEGN	865
.223000E+03	.103500E+03	.239500E+02	0.	0.	ABEGN	866
.295000E+02	.180000E+03	.134500E+03	.520000E+02	.174500E+01	ABEGN	867
0.	0.	0.	.381000E+01	.114000E+03	ABEGN	868
.295000E+03	.198000E+03	.324000E+02	0.	0.	ABEGN	869
0.	.524000E+02	.239000E+03	.272191E+03	.789000E+02	ABEGN	870
.420800E+00	.210400E+00	0.	0.	.207000E+02	ABEGN	871
.170000E+03	.313000E+03	.149000E+03	.118000E+02	0.	ABEGN	872
0.	.134000E+01	.932000E+02	.302000E+03	.249000E+03	ABEGN	873
.512000E+02	.156000E+01	0.	0.	0.	ABEGN	874
.384000E+02	.217000E+03	.302000E+03	.108000E+03	.276000E+01	ABEGN	875
0.	.524000E+01	.117000E+03	.284000E+03	.179000E+03	ABEGN	876
.265000E+02	0.	0.	0.	0.	ABEGN	877
0.	.560000E+02	.223000E+03	.223000E+03	.560000E+02	ABEGN	878
0.	0.	0.	0.	.197000E+02	ABEGN	879
.148000E+03	.252000E+03	.555389E+02	.277695E+02	.659000E+01	ABEGN	880
0.	0.	.569000E+02	.214000E+03	.198000E+03	ABEGN	881
.229661E+02	.229661E+02	0.	0.	.119000E+02	ABEGN	882
.115000E+03	.227000E+03	.115000E+03	.119000E+02	0.	ABEGN	883
0.	0.	0.	.359000E+02	.164000E+03	ABEGN	884
.186000E+03	.542000E+02	.577000E+00	0.	0.	ABEGN	885
.221000E+02	.518000E+02	.125000E+03	.800000E+02	.117000E+02	ABEGN	886
0.	0.	0.	.220000E+02	.877000E+02	ABEGN	887
.877000E+02	.110077E+02	.110077E+02	0.	0.	ABEGN	888
.903000E+01	.551000E+02	.822000E+02	.316000E+02	.106000E+01	ABEGN	889
0.	0.	0.	.382000E+00	.149000E+02	ABEGN	890
.420000E+02	.302000E+02	.532000E+01	0.	0.	ABEGN	891
0.	0.	.142000E+00	.747000E+01	.223000E+02	ABEGN	892
.173000E+02	.331000E+01	0.	0.	0.	ABEGN	893
0.	0.	.263000E+01	.992000E+01	.92[illegible]000E+01	ABEGN	894
.213000E+01	0.	0.	0.	0.	ABEGN	895
.154000E+01	.671000E+01	.723000E+01	.192000E+01	0.	ABEGN	896
0.	0.	0.	0.	.259000E+00	ABEGN	897
.212000E+01	.392000E+01	.185000E+01	.148000E+00	0.	ABEGN	898
0.	.830000E-02	.584000E+00	.189000E+01	.156000E+01	ABEGN	899
.160100E+00	.800500E-01	0.	[illegible]	0.	ABEGN	900

0.	0.	.191000E+00	.109000E+01	.152000E+01	ABEGN 901
.538000E+00	.138000E-01	0.	.205000E-01	.458000E+00	ABEGN 902
.110000E+01	.699000E+00	.516000E-01	.256000E-01	0.	ABEGN 903
0.	0.	0.	.142000E+00	.616000E+00	ABEGN 904
.665000E+00	.176000E+00	0.	0.	0.	ABEGN 905
.482000E-01	.397000E+00	.731000E+00	.346000E+00	.138000E-01	ABEGN 906
.138000E-01	0.	0.	.294000E-02	.205000E+00	ABEGN 907
.663000E+00	.547000E+00	.113000E+00	0.	0.	ABEGN 908
.138000E+00	.718000E+00	.929000E+00	.155100E+00	.775500E-01	ABEGN 909
.100000E-02	.100000E-02	0.	0.	0.	ABEGN 910
0.	.187000E-01	.313000E+00	.709000E+00	.417000E+00	ABEGN 911
.322000E-01	0.	0.	.150000E+00	.600000E+00	ABEGN 912
.600000E+00	.751000E-01	.375500E-01	0.	0.	ABEGN 913
0.	0.	0.	.600000E-01	.418000E+00	ABEGN 914
.713000E+00	.314000E+00	.950000E-02	.950000E-02	0.	ABEGN 915
0.	.440000E-02	.232000E+00	.694000E+00	.268700E+00	ABEGN 916
.268700E+00	.258000E-01	.258000E-01	0.	0.	ABEGN 917
0.	.106000E+00	.554000E+00	.717000E+00	.239000E+00	ABEGN 918
.460000E-02	0.	.222000E-01	.373000E+00	.842000E+00	ABEGN 919
.248700E+00	.248700E+00	.332000E-01	.166000E-01	0.	ABEGN 920
0.	.840000E-01	.382000E+00	.434000E+00	.126000E+01	ABEGN 921
.700000E-03	.700000E-03	0.	0.	.127000E+00	ABEGN 922
.898000E+00	.765600E+00	.765600E+00	.341300E+00	.170050E+00	ABEGN 923
.394000E-01	0.	.160000E-01	.812000E+00	.243000E+01	ABEGN 924
.188000E+01	.119800E+00	.119800E+00	.119800E+00	0.	ABEGN 925
0.	.974000E+00	.509000E+01	.329730E+01	.329730E+01	ABEGN 926
.110000E+01	.105000E-01	.210000E-01	0.	.395000E+00	ABEGN 927
.666000E+01	.151000E+02	.443310E+01	.443310E+01	.119000E+01	ABEGN 928
0.	0.	.588000E+01	0.	.235000E+02	ABEGN 929
.117500E+02	.147105E+01	.735525E+00	0.	0.	ABEGN 930
.699000E+01	.339000E+02	.206145E+02	.206145E+02	.127000E+02	ABEGN 931
.182000E+00	0.	0.	.859000E+01	.523000E+02	ABEGN 932
.780000E+02	.150105E+02	.750525E+01	.336667E+00	0.	ABEGN 933
0.	0.	.684000E+01	.562000E+02	0.	ABEGN 934
.104000E+03	.492000E+02	.390000E+01	0.	0.	ABEGN 935
.291000E+01	.649000E+02	.157000E+03	.495847E+02	.247924E+02	ABEGN 936
.490000E+01	0.	0.	0.	0.	ABEGN 937
.413000E+02	.179000E+03	.193000E+03	.501000E+02	0.	ABEGN 938
0.	.212000E+02	.159000E+03	.135095E+03	.675473E+02	ABEGN 939
.393333E+02	.166450E+01	.832250E+00	0.	0.	ABEGN 940
0.	.595000E+02	.238000E+03	.238000E+03	.595000E+02	ABEGN 941
0.	0.	0.	0.	.741000E+01	ABEGN 942
.125000E+03	.262000E+03	.835585E+02	.417793E+02	.110500E+02	ABEGN 943
0.	0.	.433060E+02	.226000E+03	.294000E+03	ABEGN 944
.980000E+02	.187000E+01	0.	.116000E+02	.147000E+03	ABEGN 945
.154500E+03	.840000E+02	.510360E+01	.102072E+02	0.	ABEGN 946
0.	.701000E+02	.132500E+03	.122500E+03	.568000E+02	ABEGN 947
0.	0.	0.	.279000E+02	.188000E+03	ABEGN 948
.300000E+03	.124000E+03	.552000E+01	0.	.386000E+01	ABEGN 949
.114000E+03	.298000E+03	.199000E+03	.327000E+02	0.	ABEGN 950
0.	.539000E+02	.245000E+03	.279000E+03	.811000E+02	ABEGN 951
.864000E+00	0.	0.	.168000E+02	.163000E+03	ABEGN 952
.323000E+03	.163000E+03	.168000E+02	0.	.114000E+01	ABEGN 953
.802000E+02	.259000E+03	.215000E+03	.439000E+02	0.	ABEGN 954
0.	0.	.263000E+02	.149000E+03	.207000E+03	ABEGN 955
.738000E+02	.189000E+01	0.	0.	.298000E+01	ABEGN 956
.666000E+02	.161000E+03	.101000E+03	.151000E+02	0.	ABEGN 957
0.	0.	.259000E+02	.104000E+03	.104000E+03	ABEGN 958
.259000E+02	0.	0.	.714000E+01	.534000E+02	ABEGN 959
.909000E+02	.401000E+02	.239000E+01	0.	0.	ABEGN 960

0.	37[illegible]000E+00	.196000E+02	.588000E+02	.455000E+02	ABEGN 961
.868000E+01		0.	0.	.431000E+01	ABEGN 962
.244000E+02	.[illegible]41000E+02	.122000E+02	.311000E+00	0.	ABEGN 963
0.	.326000E+00	.968000E+01	.252000E+02	.169000E+02	ABEGN 964
.276000E+01	0.	0.	.245000E+01	.119000E+02	ABEGN 965
.144000E+02	.446000E+01	.367000E-01	0.	0.	ABEGN 966
.267000E+00	.449000E+01	.102000E+02	.596000E+01	.799000E+00	ABEGN 967
0.	0.	0.	0.	0.	ABEGN 968
.129000E+01	.514000E+01	.514000E+01	.129000E+01	0.	ABEGN 969
0.	.163000E+00	.122000E+01	.207000E+01	.915000E+00	ABEGN 970
.544000E-01	0.	0.	.111000E-01	.439000E+00	ABEGN 971
.124000E+01	.886000E+00	.156000E+00	0.	0.	ABEGN 972
.810000E-01	.395000E+00	.477000E+00	.147000E+00	.210000E-02	ABEGN 973
0.	.116000E-01	.112000E+00	.223000E+00	.112000E+00	ABEGN 974
.116000E-01	0.	.300000E-03	.220000E-01	.759000E-01	ABEGN 975
.671000E-01	.146000E-01	0.	0.	0.	ABEGN 976
0.	0.	0.	0.	0.	ABEGN 977
0.	0.	0.	0.	0.	ABEGN 978
0.	0.	0.	0.	0.	ABEGN 979
0.	0.	0.	0.	0.	ABEGN 980
U235HE					ABEGN 981
0.	0.	0.	0.	0.	ABEGN 982
0.	0.	0.	0.	0.	ABEGN 983
0.	0.	0.	0.	.147000E+00	ABEGN 984
.[illegible]77000E+00	.126000E+01	.462000E+00	.670000E-02	0.	ABEGN 985
.340000E-01	.796000E+00	.195000E+01	.123000E+01	.904000E-01	ABEGN 986
.904000E-01	0.	0.	.577000E+00	.247000E+01	ABEGN 987
.262000E+01	.698000E+00	0.	0.	0.	ABEGN 988
.300000E+00	.233000E+01	.415000E+01	.899000E+00	.449500E+00	ABEGN 989
.383333E-01	0.	0.	.328000E-01	.172000E+01	ABEGN 990
.515000E+01	.393000E+01	.367800E+00	.183900E+00	0.	ABEGN 991
0.	.121000E+01	.604000E+01	.768000E+01	.223000E+01	ABEGN 992
.215000E-01	.215000E-01	0.	0.	.355000E+00	ABEGN 993
.444000E+01	.945000E+01	.512000E+01	.626000E+00	0.	ABEGN 994
0.	.303000E+01	.109000E+02	.101000E+02	.113680E+01	ABEGN 995
.553400E+00	0.	0.	.170000E+01	.116000E+02	ABEGN 996
.186000E+02	.773000E+01	.364000E+00	0.	0.	ABEGN 997
.339000E+00	.175000E+02	.514000E+02	.163770E+02	.106545E+02	ABEGN 998
.245667E+01	0.	0.	0.	.991000E+01	ABEGN 999
.536000E+02	.704000E+02	.240000E+02	.496000E+00	0.	ABEGN1000
.148000E+01	.382000E+02	.975000E+02	.636000E+02	.492990E+01	ABEGN1001
.492990E+01	0.	0.	.233000E+02	.966000E+02	ABEGN1002
.109000E+03	.298000E+02	0.	0.	0.	ABEGN1003
0.	.987000E+01	.812000E+02	.150000E+03	.350500E+02	ABEGN1004
.281000E+01	0.	0.	.748000E+00	.505000E+02	ABEGN1005
.160000E+03	.660000E+02	.138500E+02	0.	0.	ABEGN1006
.282000E+02	.153000E+03	.995000E+02	.340500E+02	.685000E+00	ABEGN1007
0.	0.	0.	.564000E+01	.926000E+02	ABEGN1008
.213000E+03	.122000E+03	.164000E+02	0.	0.	ABEGN1009
0.	.503000E+02	.197000E+03	.188497E+03	.473000E+02	ABEGN1010
0.	0.	0.	0.	.203000E+02	ABEGN1011
.142000E+03	.233000E+03	.997000E+02	.509000E+01	0.	ABEGN1012
0.	.193000E+01	.797000E+02	.228000E+03	.165000E+03	ABEGN1013
.294000E+02	0.	0.	0.	0.	ABEGN1014
.371000E+02	.181000E+03	.218000E+03	.681000E+02	.969000E+00	ABEGN1015
0.	.105000E+02	.115000E+03	.236000E+03	.125000E+03	ABEGN1016
.140000E+02	0.	0.	0.	0.	ABEGN1017
.598000E+00	.613000E+02	.212000E+03	.193000E+03	.431000E+02	ABEGN1018
0.	0.	0.	0.	.285000E+02	ABEGN1019
.174000E+03	.254000E+03	.482359E+02	.241180E+02	.331000E+01	ABEGN1020

0.	.925000E+00	.649000E+02	.215000E+03	.177000E+03	ABEGN1021
.178347E+02	.178347E+02	0.	0.	.182000E+02	ABEGN1022
.140000E+03	.243000E+03	.108000E+03	.752000E+01	0.	ABEGN1023
0.	0.	0.	.494000E+02	.192000E+03	ABEGN1024
.188000E+03	.441000E+02	0.	0.	0.	ABEGN1025
.792000E+01	.935000E+02	.196000E+03	.104000E+03	.130000E+02	ABEGN1026
0.	0.	.516000E+01	.473000E+02	.164000E+03	ABEGN1027
.144000E+03	.151281E+02	.151281E+02	0.	0.	ABEGN1028
.241000E+02	.120000E+03	.154000E+03	.512000E+02	.883000E+00	ABEGN1029
0.	0.	0.	.199000E+01	.475000E+02	ABEGN1030
.117000E+03	.737000E+02	.112000E+02	0.	0.	ABEGN1031
0.	0.	.649000E+00	.270000E+02	.769000E+02	ABEGN1032
.556000E+02	.991000E+01	0.	0.	0.	ABEGN1033
0.	.285000E+00	.210000E+02	.682000E+02	.571000E+02	ABEGN1034
.114000E+02	0.	0.	0.	0.	ABEGN1035
.157000E+02	.598000E+02	.562000E+02	.133000E+02	0.	ABEGN1036
0.	0.	0.	0.	.608000E+01	ABEGN1037
.408000E+02	.650000E+02	.269000E+02	.120000E+01	0.	ABEGN1038
0.	.540000E+00	.211000E+02	.593000E+02	.425000E+02	ABEGN1039
.362980E+01	.181490E+01	0.	0.	0.	ABEGN1040
0.	0.	.909000E+01	.443000E+02	.536000E+02	ABEGN1041
.168000E+02	.230000E+00	0.	.229000E+01	.271000E+02	ABEGN1042
.568000E+02	.302000E+02	.174970E+01	.874850E+00	0.	ABEGN1043
0.	0.	.113000E+00	.125470E+02	.464300E+02	ABEGN1044
.429740E+02	.993600E+01	0.	0.	0.	ABEGN1045
.528000E+00	.345000E+02	.528000E+02	.213000E+02	.410900E+00	ABEGN1046
.410900E+00	0.	0.	.544000E+00	.183000E+02	ABEGN1047
.489000E+02	.343000E+02	.598000E+01	0.	0.	ABEGN1048
.837000E+01	.391977E+02	.451412E+02	.635130E+01	.317565E+01	ABEGN1049
.242667E-01	.242667E-01	0.	0.	0.	ABEGN1050
0.	.249000E+01	.249000E+02	.508000E+02	.260000E+02	ABEGN1051
.282000E+01	0.	.133000E+00	.128000E+02	.448000E+02	ABEGN1052
.394000E+02	.471730E+01	.235865E+01	0.	0.	ABEGN1053
0.	0.	0.	.542000E+01	.333000E+02	ABEGN1054
.496000E+02	.192000E+02	.327200E+00	.327200E+00	0.	ABEGN1055
0.	.646000E+00	.193000E+02	.500000E+02	.161914E+02	ABEGN1056
.161914E+02	.132915E+01	.132915E+01	0.	0.	ABEGN1057
0.	.914000E+01	.423000E+02	.476000E+02	.138000E+02	ABEGN1058
.150000E+00	0.	.302000E+01	.292000E+02	.586000E+02	ABEGN1059
.141131E+02	.141131E+02	.145970E+01	.729850E+00	0.	ABEGN1060
0.	.123000E+02	.497000E+02	.497000E+02	.123000E+02	ABEGN1061
0.	0.	0.	0.	.644000E+01	ABEGN1062
.391000E+02	.280329E+02	.280329E+02	.105365E+02	.526825E+01	ABEGN1063
.676000E+00	0.	.814000E+00	.234000E+02	.591000E+02	ABEGN1064
.394000E+02	.203320E+01	.203320E+01	.203320E+01	0.	ABEGN1065
0.	.112000E+02	.504000E+02	.272596E+02	.272596E+02	ABEGN1066
.800000E+01	.411000E-01	.822000E-01	0.	.505000E+01	ABEGN1067
.448000E+02	.879000E+02	.212180E+02	.212180E+02	.430000E+01	ABEGN1068
0.	.323000E+00	.283000E+02	0.	.971000E+02	ABEGN1069
.422500E+02	.434995E+01	.217498E+01	0.	0.	ABEGN1070
.259000E+02	.109000E+03	.555824E+02	.555824E+02	.301000E+02	ABEGN1071
0.	0.	0.	.213000E+02	.111000E+03	ABEGN1072
.144000E+03	.232963E+02	.116482E+02	.305667E+00	0.	ABEGN1073
0.	0.	.158000E+02	.107000E+03	0.	ABEGN1074
.173000E+03	.712000E+02	.338000E+01	0.	0.	ABEGN1075
.760000E+01	.958000E+02	.203000E+03	.531658E+02	.265829E+02	ABEGN1076
.436667E+01	0.	0.	0.	.557000E+00	ABEGN1077
.582000E+02	.208000E+03	.191000E+03	.430000E+02	0.	ABEGN1078
0.	.272000E+02	.168000E+03	.120831E+03	.604157E+02	ABEGN1079
.322333E+02	.531667E+00	.265333E+00	0.	0.	ABEGN1080

.744000E+00	.702000E+02	.247000E+03	.224000E+03	.487000E+02	ABEGN1081
0.	0.	0.	0.	.137000E+02	ABEGN1082
.135000E+03	.270000E+03	.662156E+02	.331078E+02	.750000E+01	ABEGN1083
0.	0.	.433000E+02	.198000E+03	.217000E+03	ABEGN1084
.609000E+02	.581000E+00	0.	.152000E+02	.126000E+03	ABEGN1085
.120000E+03	.580000E+02	.159980E+01	.319960E+01	0.	ABEGN1086
.104000E+01	.687000E+02	.109000E+03	.895000E+02	.361000E+02	ABEGN1087
0.	0.	0.	.303000E+02	.167000E+03	ABEGN1088
.223000E+03	.784000E+02	.170000E+01	0.	.545000E+01	ABEGN1089
.930000E+02	.216000E+03	.128000E+03	.174000E+02	0.	ABEGN1090
0.	.450000E+02	.179000E+03	.178000E+03	.432000E+02	ABEGN1091
0.	0.	0.	.160000E+02	.116000E+03	ABEGN1092
.195000E+03	.830000E+02	.463000E+01	0.	.148000E+01	ABEGN1093
.618000E+02	.177000E+03	.127000E+03	.227000E+02	0.	ABEGN1094
0.	0.	.241000E+02	.118000E+03	.143000E+03	ABEGN1095
.440000E+02	.632000E+00	0.	0.	.650000E+01	ABEGN1096
.689000E+02	.142000E+03	.740000E+02	.846000E+01	0.	ABEGN1097
0.	.309000E+00	.291000E+02	.111000E+03	.911000E+02	ABEGN1098
.202000E+02	0.	0.	.105000E+02	.637000E+02	ABEGN1099
.924000E+02	.352000E+02	.113000E+01	0.	0.	ABEGN1100
0.	.863000E+00	.249000E+02	.648000E+02	.428000E+02	ABEGN1101
.669000E+01	0.	0.	0.	.431000E+01	ABEGN1102
.204000E+02	.241000E+02	.709000E+01	.905000E-01	0.	ABEGN1103
0.	.386000E+00	.624000E+01	.139000E+02	.785000E+01	ABEGN1104
.979000E+00	0.	0.	.197000E+01	.821000E+01	ABEGN1105
.841000E+01	.221000E+01	0.	0.	0.	ABEGN1106
.408000E+00	.377000E+01	.738000E+01	.369000E+01	.361000E+00	ABEGN1107
0.	0.	0.	0.	.935000E-01	ABEGN1108
.141000E+01	.503000E+01	.449000E+01	.980000E+00	0.	ABEGN1109
0.	.480000E+00	.292000E+01	.423000E+01	.162000E+01	ABEGN1110
.508000E-01	0.	0.	.600000E-01	.140000E+01	ABEGN1111
.344000E+01	.217000E+01	.329000E+00	0.	0.	ABEGN1112
.506000E+00	.214000E+01	.226000E+01	.600000E+00	0.	ABEGN1113
0.	.159000E+00	.119000E+01	.207000E+01	.903000E+00	ABEGN1114
.537000E-01	0.	.950000E-02	.467000E+00	.139000E+01	ABEGN1115
.104000E+01	.195000E+00	0.	.151000E+00	.744000E+00	ABEGN1116
.914000E+00	.287000E+00	.430000E-02	0.	0.	ABEGN1117
0.	0.	0.	0.	0.	ABEGN1118
0.	0.	0.	0.	0.	ABEGN1119
0.	0.	0.	0.	0.	ABEGN1120
U235TH					ABEGN1121
.100000E-03	.400000E-03	.600000E-03	.200000E-03	.500000E-04	ABEGN1122
0.	.100000E-03	.230000E-02	.520000E-02	.290000E-02	ABEGN1123
.400000E-03	0.	0.	0.	.390000E-02	ABEGN1124
.142000E-01	.132000E-01	.310000E-02	0.	0.	ABEGN1125
.512000E-02	.340000E-01	.533000E-01	.217000E-01	.500000E-03	ABEGN1126
.500000E-03	0.	.189000E-02	.602000E-01	.160000E+00	ABEGN1127
.110000E+00	.181000E-01	0.	0.	0.	ABEGN1128
.675000E-01	.308000E+00	.348000E+00	.500000E-01	.250000E-01	ABEGN1129
.366667E-03	0.	0.	.515000E-01	.485000E+00	ABEGN1130
.953000E+00	.473000E+00	.233000E-01	.116500E-01	0.	ABEGN1131
0.	.735000E+00	.239000E+01	.202000E+01	.415000E+00	ABEGN1132
0.	0.	0.	0.	.569000E+00	ABEGN1133
.31[illegible]000E+01	.421000E+01	.149000E+01	.328000E-01	0.	ABEGN1134
.16[illegible]E+00	.290000E+01	.661000E+01	.390000E+01	.262600E+00	ABEGN1135
.131300E+00	0.	.101000E-01	.390000E+01	.110000E+02	ABEGN1136
.789000E+01	.139000E+01	0.	0.	0.	ABEGN1137
.443000E+01	.202000E+02	.229000E+02	.286500E+01	.189885E+01	ABEGN1138
.237667E-01	0.	0.	.248000E+01	.240000E+02	ABEGN1139
.475000E+02	.240000E+02	.248000E+01	0.	0.	ABEGN1140

.569000E+01	.383000E+02	.609000E+02	.250000E+02	.555200E+00	ABEGN1141
.555200E+00	0.	.852000E+00	.328000E+02	.913000E+02	ABEGN1142
.649000E+02	.111000E+02	0.	0.	0.	ABEGN1143
0.	.186000E+02	.901000E+02	.107000E+03	.164000E+02	ABEGN1144
.214000E+00	0.	0.	.789000E+01	.826000E+02	ABEGN1145
.170000E+03	.434500E+02	.466500E+01	0.	.621000E+00	ABEGN1146
.573000E+02	.200000E+03	.875000E+02	.193000E+02	0.	ABEGN1147
0.	0.	0.	.302000E+02	.180000E+03	ABEGN1148
.263000E+03	.986000E+02	0.	0.	0.	ABEGN1149
.452000E+01	.110000E+03	.270000E+03	.172069E+03	.258000E+02	ABEGN1150
0.	0.	0.	0.	.539000E+02	ABEGN1151
.231000E+03	.246000E+03	.659000E+02	.605000E+00	0.	ABEGN1152
0.	.200000E+02	.168000E+03	.304000E+03	.141000E+03	ABEGN1153
.103000E+02	0.	0.	0.	.142000E+01	ABEGN1154
.884000E+02	.279000E+03	.225000E+03	.445000E+02	0.	ABEGN1155
0.	.402000E+02	.212000E+03	.277000E+03	.944000E+02	ABEGN1156
.189000E+01	0.	0.	0.	0.	ABEGN1157
.758000E+01	.130000E+03	.294000E+03	.171000E+03	.227000E+02	ABEGN1158
0.	0.	0.	0.	.613000E+02	ABEGN1159
.246000E+03	.241000E+03	.297619E+02	.148810E+02	0.	ABEGN1160
0.	.102000E+02	.131000E+03	.274000E+03	.146000E+03	ABEGN1161
.860350E+01	.860350E+01	0.	0.	.495000E+02	ABEGN1162
.229000E+03	.259000E+03	.681000E+02	.805000E+00	0.	ABEGN1163
0.	0.	.495000E+01	.119000E+03	.292000E+03	ABEGN1164
.186000E+03	.280000E+02	0.	0.	0.	ABEGN1165
.319000E+02	.170000E+03	.223000E+03	.760000E+02	.157000E+01	ABEGN1166
0.	0.	.551000E+01	.871000E+02	.194000E+03	ABEGN1167
.111000E+03	.705280E+01	.705280E+01	0.	.510000E+00	ABEGN1168
.390000E+02	.128000E+03	.108000E+03	.222000E+02	0.	ABEGN1169
0.	0.	0.	.807000E+01	.531000E+02	ABEGN1170
.834000E+02	.340000E+02	.140000E+01	0.	0.	ABEGN1171
0.	0.	.292000E+01	.238000E+02	.431000E+02	ABEGN1172
.198000E+02	.776000E+00	0.	0.	0.	ABEGN1173
0.	.749000E+00	.887000E+01	.186000E+02	.985000E+01	ABEGN1174
.114000E+01	0.	0.	0.	.173000E+00	ABEGN1175
.371000E+01	.887000E+01	.551000E+01	.806000E+00	0.	ABEGN1176
0.	0.	0.	0.	.655000E+00	ABEGN1177
.274000E+01	.286000E+01	.746000E+00	0.	0.	ABEGN1178
0.	.982000E-01	.785000E+00	.142000E+01	.658000E+00	ABEGN1179
.227000E-01	.113500E-01	0.	0.	0.	ABEGN1180
0.	.400000E-02	.247000E+00	.778000E+00	.624000E+00	ABEGN1181
.124000E+00	0.	0.	.114000E+00	.609000E+00	ABEGN1182
.805000E+00	.275000E+00	.280000E-02	.140000E-02	0.	ABEGN1183
0.	0.	.111000E-01	.202000E+00	.469000E+00	ABEGN1184
.280000E+00	.383000E-01	0.	0.	0.	ABEGN1185
.150000E+00	.633000E+00	.649000E+00	.166000E+00	0.	ABEGN1186
0.	0.	0.	.475000E-01	.371000E+00	ABEGN1187
.646000E+00	.290000E+00	.186000E-01	0.	.300000E-02	ABEGN1188
.163000E+00	.487000E+00	.375000E+00	.353000E-01	.176500E-01	ABEGN1189
0.	0.	0.	0.	0.	ABEGN1190
0.	.117000E+00	.617000E+00	.801000E+00	.267000E+00	ABEGN1191
.498000E-01	0.	.150000E-01	.232000E+00	.518000E+00	ABEGN1192
.296000E+00	.194000E-01	.970000E-02	0.	0.	ABEGN1193
0.	0.	0.	.143000E+00	.574000E+00	ABEGN1194
.567000E+00	.139000E+00	0.	0.	0.	ABEGN1195
0.	.540000E-01	.395000E+00	.667000E+00	.143100E+00	ABEGN1196
.143100E+00	.375000E-02	.375000E-02	0.	0.	ABEGN1197
.650000E-02	.213000E+00	.625000E+00	.476000E+00	.380000E-01	ABEGN1198
0.	0.	.951000E-01	.487000E+00	.610000E+00	ABEGN1199
.101100E+00	.101100E+00	.200000E-03	.160000E-02	0.	ABEGN1200

.100000E-01	.274000E+00	.696000E+00	.456000E+00	.709000E-01	ABEGN1201
0.	0.	0.	0.	.174000E+00	ABEGN1202
.657000E+00	.315700E+00	.315700E+00	.761000E-01	.380500E-01	ABEGN1203
0.	0.	.710000E-01	.520000E+00	.826000E+00	ABEGN1204
.346000E+00	.570000E-02	.570000E-02	.570000E-02	0.	ABEGN1205
.680000E-01	.329000E+00	.937000E+00	.349700E+00	.349700E+00	ABEGN1206
.640000E-01	0.	0.	0.	.226000E+00	ABEGN1207
.113000E+01	.139000E+01	.219600E+00	.219600E+00	.670000E-02	ABEGN1208
0.	.130000E+00	.178000E+01	0.	.876000E+01	ABEGN1209
.103500E+01	.650500E-01	.325250E-01	0.	.190000E+00	ABEGN1210
.641000E+01	.172000E+02	.585240E+01	.585240E+01	.197000E+01	ABEGN1211
0.	0.	.113000E+00	.110000E+02	.338000E+02	ABEGN1212
.291000E+02	.309630E+01	.154815E+01	0.	0.	ABEGN1213
0.	0.	.183000E+02	.770000E+02	0.	ABEGN1214
.812000E+02	.217000E+02	.562000E+00	0.	0.	ABEGN1215
.177000E+02	.974000E+02	.131000E+03	.230092E+02	.115046E+02	ABEGN1216
.315000E+00	0.	0.	0.	.486000E+01	ABEGN1217
.883000E+02	.206000E+03	.122000E+03	.167000E+02	0.	ABEGN1218
0.	.664000E+02	.266000E+03	.130552E+03	.652761E+02	ABEGN1219
.214667E+02	0.	0.	0.	0.	ABEGN1220
.105000E+02	.170000E+03	.378000E+03	.217000E+03	.275000E+02	ABEGN1221
0.	0.	0.	0.	.437000E+02	ABEGN1222
.225000E+03	.285000E+03	.465186E+02	.232593E+02	0.	ABEGN1223
0.	.227000E+01	.102000E+03	.268000E+03	.211000E+03	ABEGN1224
.377000E+02	0.	0.	.460000E+02	.220000E+03	ABEGN1225
.133000E+03	.407500E+02	.292650E+00	.585300E+00	0.	ABEGN1226
.127000E+02	.133000E+03	.137500E+03	.700000E+02	.127000E+02	ABEGN1227
0.	0.	.757000E+00	.777000E+02	.275000E+03	ABEGN1228
.244000E+03	.547000E+02	0.	0.	.286000E+02	ABEGN1229
.202000E+03	.296000E+03	.112000E+03	.371000E+01	0.	ABEGN1230
.445000E+01	.116000E+03	.296000E+03	.193000E+03	.341000E+02	ABEGN1231
0.	0.	0.	.536000E+02	.232000E+03	ABEGN1232
.249000E+03	.670000E+02	0.	0.	.190000E+02	ABEGN1233
.151000E+03	.277000E+03	.143000E+03	.125000E+02	0.	ABEGN1234
0.	.125000E+01	.776000E+02	.244000E+03	.196000E+03	ABEGN1235
.385000E+02	0.	0.	0.	.256000E+02	ABEGN1236
.134000E+03	.175000E+03	.595000E+02	.111000E+01	0.	ABEGN1237
0.	.340000E+01	.648000E+02	.145000E+03	.837000E+02	ABEGN1238
.112000E+02	0.	0.	.260000E+02	.963000E+02	ABEGN1239
.927000E+02	.221000E+02	0.	0.	0.	ABEGN1240
0.	.704000E+01	.493000E+02	.799000E+02	.332000E+02	ABEGN1241
.155000E+01	0.	0.	.286000E+00	.163000E+02	ABEGN1242
.500000E+02	.388000E+02	.754000E+01	0.	0.	ABEGN1243
0.	.835000E+00	.135000E+02	.302000E+02	.170000E+02	ABEGN1244
.212000E+01	0.	.236000E+00	.758000E+01	.203000E+02	ABEGN1245
.138000E+02	.232000E+01	0.	0.	0.	ABEGN1246
.198000E+01	.988000E+01	.121000E+02	.383000E+01	.592000E-01	ABEGN1247
0.	0.	0.	0.	.224000E+00	ABEGN1248
.361000E+01	.805000E+01	.463000E+01	.603000E+00	0.	ABEGN1249
0.	.824000E+00	.310000E+01	.299000E+01	.716000E+00	ABEGN1250
0.	0.	0.	.145000E+00	.960000E+00	ABEGN1251
.151000E+01	.619000E+00	.249000E-01	0.	.820000E-02	ABEGN1252
.241000E+00	.646000E+00	.440000E+00	.738000E-01	0.	ABEGN1253
0.	.647000E-01	.291000E+00	.324000E+00	.920000E-01	ABEGN1254
.900000E-03	0.	.600000E-02	.508000E-01	.954000E-01	ABEGN1255
.453000E-01	.390000E-02	.200000E-03	.143000E-01	.456000E-01	ABEGN1256
.371000E-01	.750000E-02	0.	0.	.210000E-02	ABEGN1257
.112000E-01	.147000E-01	.490000E-02	.200000E-03	0.	ABEGN1258
0.	.100000E-03	.160000E-02	.360000E-02	.200000E-02	ABEGN1259
.300000E-03	0.	0.	0.	0.	ABEGN1260

U238FI					ABEGN1261
0.	0.	0.	0.	0.	ABEGN1262
0.	0.	0.	0.	0.	ABEGN1263
0.	0.	0.	0.	0.	ABEGN1264
0.	0.	0.	0.	0.	ABEGN1265
0.	0.	0.	0.	0.	ABEGN1266
0.	0.	.810000E-02	.362000E-01	.420000E-01	ABEGN1267
.135000E-01	.100000E-03	0.	0.	.760000E-02	ABEGN1268
.931000E-01	.179000E+00	.931000E-01	.370000E-02	.185000E-02	ABEGN1269
0.	0.	.220000E-02	.197000E+00	.613000E+00	ABEGN1270
.529000E+00	.119000E+00	0.	0.	0.	ABEGN1271
.210000E+00	.128000E+01	.191000E+01	.776000E+00	.209000E-01	ABEGN1272
0.	0.	0.	.180000E+00	.221000E+01	ABEGN1273
.423000E+01	.221000E+01	.180000E+00	0.	.246000E-01	ABEGN1274
.222000E+01	.670000E+01	.595000E+01	.134000E+01	0.	ABEGN1275
0.	0.	.539000E+00	.661000E+01	.127000E+02	ABEGN1276
.661000E+01	.539000E+00	0.	0.	.637000E-01	ABEGN1277
.573000E+01	.178000E+02	.130000E+02	.144010E+01	.954450E+00	ABEGN1278
0.	0.	0.	.425000E+01	.259000E+02	ABEGN1279
.387000E+02	.157000E+02	.425000E+00	0.	.520000E+00	ABEGN1280
.192000E+02	.473000E+02	.317000E+02	.520000E+01	0.	ABEGN1281
0.	0.	.113000E+02	.500000E+02	.579000E+02	ABEGN1282
.186000E+02	.208000E+00	0.	0.	0.	ABEGN1283
.356000E+01	.436000E+02	.837000E+02	.436000E+02	.178000E+01	ABEGN1284
0.	0.	.326000E+00	.293000E+02	.911000E+02	ABEGN1285
.785000E+02	.885000E+01	0.	0.	.146000E+02	ABEGN1286
.684000E+02	.132000E+03	.268000E+02	.730000E+00	0.	ABEGN1287
0.	0.	.159000E+01	.586000E+02	.147000E+03	ABEGN1288
.965000E+02	.159000E+02	0.	0.	0.	ABEGN1289
.321000E+02	.143000E+03	.166000E+03	.515898E+02	.593000E+01	ABEGN1290
0.	0.	0.	.910000E+01	.111000E+03	ABEGN1291
.214000E+03	.111000E+03	.910000E+01	0.	0.	ABEGN1292
.740000E+01	.666000E+02	.207000E+03	.179000E+03	.402000E+02	ABEGN1293
0.	0.	0.	0.	.270000E+02	ABEGN1294
.166000E+03	.246000E+03	.999000E+02	.270000E+01	0.	ABEGN1295
.114000E+02	.140000E+03	.268000E+03	.140000E+03	.114000E+02	ABEGN1296
0.	0.	0.	0.	.892000E+00	ABEGN1297
.804000E+02	.250000E+03	.215000E+03	.485000E+02	0.	ABEGN1298
0.	0.	.307000E+02	.187000E+03	.279000E+03	ABEGN1299
.114000E+03	.307000E+01	0.	0.	0.	ABEGN1300
.935000E+00	.841000E+02	.262000E+03	.223000E+03	.507000E+02	ABEGN1301
0.	0.	0.	.126000E+02	.154000E+03	ABEGN1302
.296000E+03	.154000E+03	.126000E+02	0.	0.	ABEGN1303
0.	0.	.530000E+02	.235000E+03	.273000E+03	ABEGN1304
.878000E+02	.975000E+00	0.	0.	.327000E+01	ABEGN1305
.121000E+03	.298000E+03	.200000E+03	.327000E+02	0.	ABEGN1306
0.	0.	.888000E+02	.276000E+03	.238000E+03	ABEGN1307
.537000E+02	0.	0.	0.	.330000E+02	ABEGN1308
.201000E+03	.300000E+03	.122000E+03	.330000E+01	0.	ABEGN1309
0.	0.	.306000E+01	.113000E+03	.279000E+03	ABEGN1310
.187000E+03	.306000E+02	0.	0.	0.	ABEGN1311
0.	.810000E+00	.729000E+02	.227000E+03	.196000E+03	ABEGN1312
.440000E+02	0.	0.	0.	0.	ABEGN1313
.406000E+00	.364000E+02	.113000E+03	.977000E+02	.220000E+03	ABEGN1314
0.	0.	0.	0.	.109000E+02	ABEGN1315
.482000E+02	.559000E+02	.179000E+02	.199000E+00	0.	ABEGN1316
0.	0.	0.	.123000E+01	.159000E+02	ABEGN1317
.305000E+02	.159000E+02	.123000E+01	0.	0.	ABEGN1318
.480000E-01	.432000E+01	.135000E+02	.116000E+02	.260000E+01	ABEGN1319
0.	0.	0.	0.	0.	ABEGN1320

0.	.724000E+00	.442000E+01	.660000E+01	.268000E+01	ABEGN1321
.724000E-01	0.	.380000E-01	.141000E+01	.346000E+01	ABEGN1322
.232000E+01	.380000E+00	0.	0.	0.	ABEGN1323
0.	0.	.375000E+00	.167000E+01	.193000E+01	ABEGN1324
.621000E+00	.690000E-02	0.	0.	.210000E+00	ABEGN1325
.128000E+01	.191000E+01	.777000E+00	.921000E+00	0.	ABEGN1326
0.	0.	.197000E-01	.731000E+00	.179000E+01	ABEGN1327
.120000E+01	.197000E+00	0.	0.	.302000E+00	ABEGN1328
.134000E+01	.155000E+01	.500000E+00	.270000E-02	.135000E-02	ABEGN1329
0.	0.	0.	0.	0.	ABEGN1330
.714000E-01	.875000E+00	.168000E+01	.875000E+00	.714000E-01	ABEGN1331
0.	.520000E-02	.473000E+00	.147000E+01	.127000E+01	ABEGN1332
.285000E+00	0.	0.	0.	0.	ABEGN1333
0.	0.	.173000E+00	.106000E+01	.158000E+01	ABEGN1334
.642000E+00	.173000E-01	0.	0.	0.	ABEGN1335
.174000E-01	.645000E+00	.158000E+01	.107000E+01	.842000E-01	ABEGN1336
.842000E-01	0.	0.	0.	0.	ABEGN1337
.285000E+00	.127000E+01	.147000E+01	.473000E+00	.520000E-02	ABEGN1338
0.	0.	.724000E-01	.887000E+00	.170000E+01	ABEGN1339
.429300E+00	.429300E+00	.351000E-01	.175500E-01	0.	ABEGN1340
.310000E+00	.138000E+01	.160000E+01	.513000E+00	.570000E-02	ABEGN1341
0.	0.	0.	.202000E+00	.123000E+01	ABEGN1342
.183000E+01	.361100E+00	.361100E+00	.100000E-03	.500000E-04	ABEGN1343
0.	.220000E-01	.814000E+00	.200000E+01	.134000E+01	ABEGN1344
.220000E+00	0.	0.	0.	0.	ABEGN1345
.399000E+00	.177000E+01	.206000E+01	.320400E+00	.320400E+00	ABEGN1346
.370000E-01	0.	0.	.118000E+00	.145000E+01	ABEGN1347
.277000E+01	.145000E+01	.571000E-01	.571000E-01	0.	ABEGN1348
.180000E-01	.162000E+01	.504000E+01	0.	.434000E+01	ABEGN1349
.489000E+00	0.	0.	0.	.301000E+01	ABEGN1350
.134000E+02	.155000E+02	.241980E+01	.241980E+01	.555000E-01	ABEGN1351
0.	0.	.455000E+01	.278000E+02	.413000E+02	ABEGN1352
.169000E+02	.220200E+00	.110100E+00	0.	0.	ABEGN1353
0.	.378000E+01	.463000E+02	.880000E+02	0.	ABEGN1354
.463000E+02	.378000E+01	0.	0.	.148000E+01	ABEGN1355
.548000E+02	.135000E+03	.114000E+03	.716260E+01	.358130E+01	ABEGN1356
0.	0.	0.	.705000E+00	.634000E+02	ABEGN1357
.197000E+03	.170000E+03	.383000E+02	0.	0.	ABEGN1358
.275000E+02	.168000E+03	.250000E+03	.493636E+02	.246818E+02	ABEGN1359
.916667E+00	0.	0.	0.	.990000E+00	ABEGN1360
.891000E+02	.277000E+03	.239000E+03	.538000E+02	0.	ABEGN1361
0.	0.	0.	.120000E+02	.147000E+03	ABEGN1362
.282000E+03	.147000E+03	.580750E+01	.290375E+01	0.	ABEGN1363
0.	.480000E+02	.213000E+03	.248000E+03	.801000E+02	ABEGN1364
.884000E+00	0.	.124000E+02	.152000E+03	.291000E+03	ABEGN1365
.760000E+02	.620000E+01	0.	0.	.938000E+00	ABEGN1366
.844000E+02	.263000E+03	.113000E+03	.254500E+02	0.	ABEGN1367
0.	0.	.308000E+02	.188000E+03	.280000E+03	ABEGN1368
.114000E+03	.308000E+01	0.	.285000E+01	.105000E+03	ABEGN1369
.259000E+03	.174000E+03	.285000E+02	0.	0.	ABEGN1370
.460000E+02	.204000E+03	.237000E+03	.763000E+02	.848000E+00	ABEGN1371
0.	0.	.108000E+02	.132000E+03	.254000E+03	ABEGN1372
.132000E+03	.108000E+02	0.	.750000E+00	.675000E+02	ABEGN1373
.210000E+03	.181000E+03	.408000E+02	0.	0.	ABEGN1374
0.	.225000E+02	.137000E+03	.205000E+03	.832000E+02	ABEGN1375
.225000E+01	0.	0.	.780000E+01	.955000E+02	ABEGN1376
.183000E+03	.955000E+02	.780000E+01	0.	0.	ABEGN1377
.465000E+00	.418000E+02	.130000E+03	.112000E+03	.253000E+02	ABEGN1378
0.	0.	.131000E+02	.793000E+02	.118000E+03	ABEGN1379
.481000E+02	.130000E+01	0.	0.	0.	ABEGN1380

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 .685000E+00  .253000E+02  .623000E+02  .418000E+02  .685000E+01 ABEGN1384
 0.           0.           .798000E+01  .355000E+02  .412000E+02 ABEGN1385
 .132000E+02  .147000E+00  0.           0.           0.          ABEGN1386
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 .126000E+01  .768000E+01  .115000E+02  .466000E+01  .127000E+00 ABEGN1390
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 .464000E+01  .760000E+00  0.           0.           .579000E+00 ABEGN1392
 .257000E+01  .298000E+01  .959000E+00  .107000E-01  0.          ABEGN1393
 .839000E-01  .103000E+01  .197000E+01  .103000E+01  .839000E-01 ABEGN1394
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 .155000E+00  .420000E-02  0.           .700000E-02  .856000E-01 ABEGN1397
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 .200000E-03  .216000E-01  .672000E-01  .579000E-01  .130000E-01 ABEGN1399
 0.           0.           0.           0.           0.          ABEGN1400
U238HE                                                           ABEGN1401
 0.           0.           0.           0.           0.          ABEGN1402
 0.           0.           0.           0.           0.          ABEGN1403
 0.           0.           0.           0.           0.          ABEGN1404
 0.           0.           0.           0.           0.          ABEGN1405
 .871000E-01  .348000E+00  .348000E+00  .871000E-01  0.          ABEGN1406
 0.           0.           .930000E-01  .697000E+00  .119000E+01 ABEGN1407
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 .441000E+01  .214000E+02  .260000E+02  .346860E+01  .229900E+01 ABEGN1418
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 .107000E+02  .463000E+02  .498000E+02  .132000E+02  0.          ABEGN1421
 0.           0.           .555000E+01  .415000E+02  .708000E+02 ABEGN1422
 .312000E+02  .186000E+01  0.           0.           0.          ABEGN1423
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 0.           0.           0.           .149000E+02  .777000E+02 ABEGN1425
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 .549000E+02  .125000E+03  .365500E+02  .489000E+01  0.          ABEGN1427
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 0.           .361000E+02  .165000E+03  .187000E+03  .543000E+02 ABEGN1433
 .579000E+00  0.           0.           0.           0.          ABEGN1434
 .120000E+02  .116000E+03  .229000E+03  .116000E+03  .120000E+02 ABEGN1435
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.834000E+02	.250000E+03	.193000E+03	.369000E+02	0.	ABEGN1443
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.106000E+03	.477000E+01	0.	0.	.708000E+00	ABEGN1445
.664000E+02	.229000E+03	.202000E+03	.442000E+02	0.	ABEGN1446
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.793000E+02	.101840E+01	.101840E+01	0.	.791000E+01	ABEGN1448
.993000E+02	.210000E+03	.114000E+03	.139000E+02	0.	ABEGN1449
0.	0.	0.	.391000E+02	.156000E+03	ABEGN1450
.156000E+03	.391000E+02	0.	0.	0.	ABEGN1451
0.	0.	.277000E+02	.126000E+03	.144000E+03	ABEGN1452
.417000E+02	.445000E+00	0.	0.	0.	ABEGN1453
0.	.163000E+02	.851000E+02	.110000E+03	.367000E+02	ABEGN1454
.701000E+00	0.	0.	0.	.868000E+01	ABEGN1455
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0.	0.	0.	.821000E+00	.244000E+02	ABEGN1457
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0.	.961000E+01	.439000E+02	.499000E+02	.144000E+02	ABEGN1459
.773000E-01	.386500E-01	0.	0.	0.	ABEGN1460
0.	.252000E+01	.243000E+02	.483000E+02	.243000E+02	ABEGN1461
.252000E+01	0.	.126000E+00	.119000E+02	.405000E+02	ABEGN1462
.357000E+02	.782000E+01	0.	0.	0.	ABEGN1463
0.	0.	.348000E+01	.212000E+02	.317000E+02	ABEGN1464
.122000E+02	.411000E+00	0.	0.	.596000E+00	ABEGN1465
.150000E+02	.390000E+02	.262000E+02	.429000E+01	0.	ABEGN1466
0.	0.	0.	.570000E+01	.261000E+02	ABEGN1467
.295000E+02	.857000E+01	.914000E-01	0.	.175000E+01	ABEGN1468
.170000E+02	.336000E+02	.170000E+02	.877900E+00	.438950E+00	ABEGN1469
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0.	.142000E+00	.100000E+02	.322000E+02	.266000E+02	ABEGN1479
.274410E+01	.274410E+01	0.	0.	0.	ABEGN1480
.342000E+01	.231000E+02	.366000E+02	.152000E+02	.677000E+00	ABEGN1481
0.	0.	0.	.738000E+00	.165000E+02	ABEGN1482
.399000E+02	.126417E+02	.126417E+02	.187620E+01	.933100E+00	ABEGN1483
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.558000E+02	.461000E+02	.475570E+01	.475570E+01	0.	ABEGN1488
0.	.975000E+01	.552000E+02	0.	.770000E+02	ABEGN1489
.136500E+02	.175850E+00	.879250E-01	0.	.838000E+01	ABEGN1490
.628000E+02	.107000E+03	.236280E+02	.236280E+02	.280000E+01	ABEGN1491
0.	0.	.516000E+01	.680000E+02	.136000E+03	ABEGN1492
.743000E+02	.453500E+01	.226750E+01	0.	0.	ABEGN1493
0.	.222000E+01	.661000E+02	.172000E+03	0.	ABEGN1494
.115000E+03	.189000E+02	0.	0.	.628000E+00	ABEGN1495
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0.	0.	0.	0.	.237000E+02	ABEGN1497
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.566000E+01	.126000E+03	.307000E+03	.968195E+02	.484098E+02	ABEGN1499
.953333E+01	0.	0.	0.	0.	ABEGN1500

.331000E+02	.189000E+03	.263000E+03	.932000E+02	.239000E+01	ABEGN1501
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0.	0.	.307000E+02	.174000E+03	.242000E+03	ABEGN1504
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.910000E+02	.173500E+02	0.	0.	0.	ABEGN1506
.337000E+02	.176000E+03	.114000E+03	.380000E+02	.144000E+01	ABEGN1507
0.	0.	.565000E+01	.955000E+02	.216000E+03	ABEGN1508
.126000E+03	.169000E+02	0.	0.	.506000E+02	ABEGN1509
.190000E+03	.178000E+03	.410000E+02	0.	0.	ABEGN1510
.186000E+02	.126000E+03	.200000E+03	.823000E+02	.369000E+01	ABEGN1511
0.	0.	.162000E+01	.635000E+02	.176000E+03	ABEGN1512
.129000E+03	.226000E+02	0.	0.	.293000E+02	ABEGN1513
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0.	.816000E+01	.788000E+02	.156000E+03	.786000E+02	ABEGN1515
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0.	.132139E+02	.749980E+02	.104759E+03	.370823E+02	ABEGN1518
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0.	0.	0.	.331360E+01	.319607E+02	ABEGN1522
.634513E+02	.319607E+02	.331360E+01	0.	0.	ABEGN1523
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0.	0.	.316000E+01	.237000E+02	.403000E+02	ABEGN1525
.178000E+02	.106000E+01	0.	0.	0.	ABEGN1526
.117000E+00	.817000E+01	.264000E+02	.218000E+02	.449000E+01	ABEGN1527
0.	0.	0.	0.	.220000E+01	ABEGN1528
.125000E+02	.174000E+02	.618000E+01	.158000E+00	0.	ABEGN1529
.219000E+00	.490000E+01	.119000E+02	.748000E+01	.111000E+01	ABEGN1530
0.	0.	0.	.158000E+01	.632000E+01	ABEGN1531
.632000E+01	.158000E+01	0.	0.	.434000E+00	ABEGN1532
.325000E+01	.553000E+01	.244000E+01	.145000E+00	0.	ABEGN1533
.344000E-01	.134000E+01	.379000E+01	.271000E+01	.479000E+00	ABEGN1534
0.	0.	.418000E+00	.204000E+01	.246000E+01	ABEGN1535
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.920000E+00	.945000E-01	0.	.307000E+00	.106000E+01	ABEGN1537
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0.	.935000E-01	.529000E+00	.738000E+00	.263000E+00	ABEGN1539
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.947000E+00	.531000E+00	.286000E-01	.143000E-01	0.	ABEGN1551
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.261000E+00	0.	0.	0.	.969500E+01	ABEGN1595
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ATTN: P. Haas

Rand Corp.
ATTN: Library
ATTN: T. Parker
ATTN: J. Digby

Santa Fe Corp.
ATTN: D. Paolucci
ATTN: N. Polmar
ATTN: E. Ortlieb
ATTN: M. Wade
3 cy ATTN: A. Billones

DEPARTMENT OF DEFENSE CONTRACTORS (Continued)

Science Applications, Inc.
ATTN: M. Drake
ATTN: J. Martin
ATTN: C. Whittenbury

Science Applications, inc.
ATTN: J. Goldstein
ATTN: J. McGahan
ATTN: W. Layson

DEPARTMENT OF DEFENSE CONTRACTORS (Continued)

System Planning Corp.
ATTN: F. Adelman
ATTN: J. Douglas
ATTN: G. Parks